The RUBBER AGE

April, 1942

July – v. 50

Materials for use in the

LOADING

and

PLASTICIZING

of the Butadiene Type Synthetic Rubbers

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CHANNEL "S"

TYSONITE

for Black Mechanicals and

KALVAN "S"

for light weight, light color Rubberized Fabrics

R. T. VANDERBILT CO., INC.

230 Park Avenue, New York City

Newsletter No. 4 *PUBLISHED BY RUBBER CHEMICALS DIVISION OF* DU PONT *APRIL, 1942*

Processability of Stocks Containing Reclaimed Rubber Improved by the Use of RPA No. 3

THE INCREASED CONSUMPTION of reclaimed rubber and particularly its use in articles that heretofore have been made primarily from crude has made the life of many a technical or production man a continuous nightmare. The effect on processability of the substitution of reclaimed for crude rubber has been an important factor contributing to production delays. While stocks made from crude could be readily extruded or calendered and made into smooth-spreading cements, similar stocks made principally from reclaimed rubber caused real trouble. These problems can be largely avoided by the use of RPA No. 3 to peptize and smooth out reclaimed rubber.

RPA No. 3 should be mixed with reclaimed rubber in a Banbury Mixer or on a hot mill. Larger quantities of RPA No. 3 are required to effectively smooth out reclaimed rubber than is the case with crude, and its effectiveness depends to a considerable extent upon the free sulfur content of the reclaim. For initial investigations we suggest the use of 1.0% to 2.0% of RPA No. 3 on the rubber hydrocarbon in the reclaim; larger amounts may be required with reclaimed rubber having a high free sulfur content.

The advantages of RPA No. 3 over straight mastication in increasing the plasticity and in improving the processability of reclaimed rubber are shown in Table I below. One per cent of RPA No. 3 (on the rubber hydrocarbon content) was added to a whole tire reclaim having the following analysis:

Whole Tire Reclaim—

Specific Gravity	1.15
Rubber Hydrocarbon	55.0%
Acetone Extractable	11.34
Ash	16.55
Total Sulfur	1.81
Carbon Black	14.98
Alkalinity	0.44
Zinc Oxide	6.4

A hot mill (roll temperature 210°F to 240°F) was used.

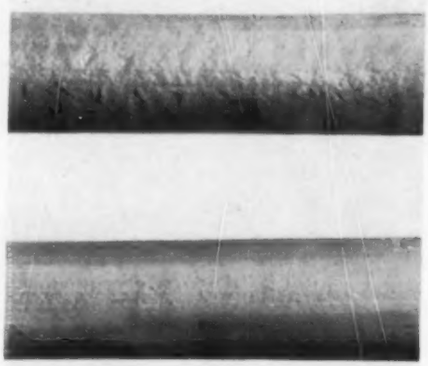
TABLE I
EFFECT OF MILLING WITH AND WITHOUT RPA NO. 3 ON THE PLASTICITY OF RECLAIMED RUBBER

Milling Time Minutes	Plasticity-Recovery Without RPA No. 3	Plasticity-Recovery With 1.0% RPA No. 3
0	200-190	200-190
10	165-109	144- 80
15	154- 92	142- 77
20	153- 86	132- 66
30	149- 82	131- 62
45	141- 81	135- 65

From an examination of the data in Table I it can readily be seen that the use of RPA No. 3 gives these advantages:

1. It produces a softer, better processing material.
2. It reduces breakdown time. For example, a plasticity-recovery of 141-81 was reached in 10 to 15 minutes with 1.0% of RPA No. 3, but it required 45 minutes' milling to plasticize the reclaim to the same extent in the absence of RPA No. 3.

The photographs below illustrate the difference in extrusion qualities of stocks containing reclaimed rubber plasticized in the conventional manner and with RPA No. 3.



Following are the formulas for the compounds tested:

COMPOUND 1021	-20	-21
Whole Tire Reclaim	181.0*	181.0*
RPA NO. 3	2.0	—
Carbonex S Plastic	15.0	15.0
Channel Black	20.0	20.0
Semi-reinforcing Black	50.0	50.0
HELIOZONE	2.0	2.0
ACCELERATOR 808	1.5	1.5
NEOZONE A	1.5	1.5
Zinc Oxide	3.0	3.0
Sulfur	3.0	3.0

*100 parts rubber hydrocarbon.

In order to make a stock that would extrude as smoothly as possible, 2% of RPA No. 3 was used in compound 1021-20.

Through the Mill

FREEZE RESISTING RUBBER compounds are becoming more and more important in the development of various products for special applications. For the best freeze resisting rubber the following compounding principles should be observed:

1. *Use minimum filler loading for desired hardness.*
2. *Select softeners least affected by low temperatures.*
3. *Accelerate with a thiuram and high sulfur to give a tight cure and high percentage of combined sulfur.*

We recommend the following acceleration on 100 parts of rubber to meet freeze resistant specifications:

Thionex . . 0.3 parts
Sulfur . . . . 3.0 parts

RECLAIMED RUBBER must now be used in a variety of products previously made wholly or to a large extent from crude rubber. The following accelerator combinations give excellent results with reclaimed rubber. The indicated quantities represent parts per 100 parts of rubber hydrocarbon in the compound.

	ACCELERATION	PARTS
1.	*Accelerator 808**	0.5
2.	*Thionex*	0.18
	Litharge	0.18
3.	*Zenite*	0.52
	DOTG	0.26
4.	*Zenite*	0.47
	Accelerator 808	0.19
5.	*2-MT*	0.5
	Retarder W	0.2
6.	*2-MT*	0.55
	Accelerator 808	0.1

**Accelerator 808 is retarded by high clay loading.*

BIBB WASHER compounds are described in a recent informal report. Both soft and hard rubber types are included.

RUBBER CHEMICALS DIVISION

Wilmington DU PONT *Delaware*

REG. U. S. PAT. OFF.

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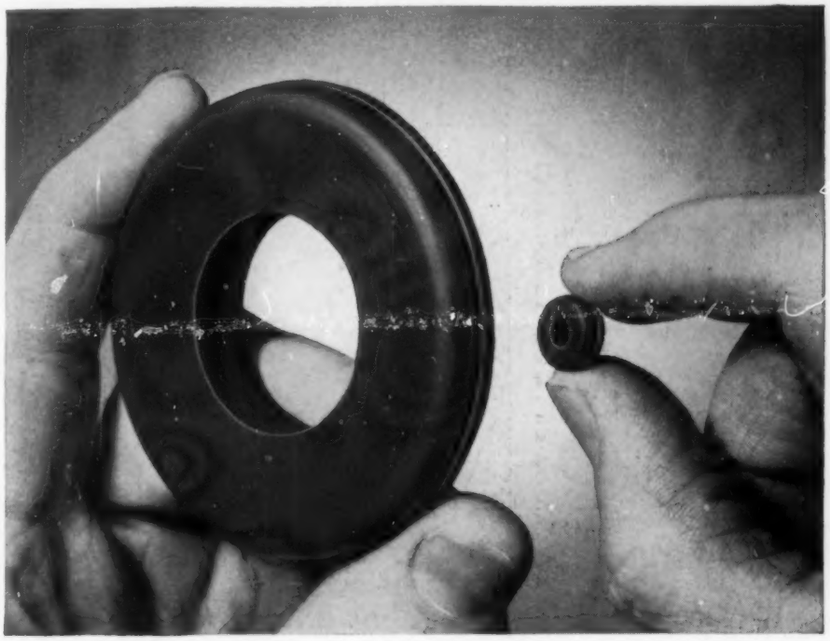

For a bomber's arteries—cushions of **HYCAR**

THE arteries of a bomber are the hundreds of small tubes that carry fuel and oil throughout its complex interior. Reaching into every part of the plane they must pass through a great many structural members—ribs, partitions, and other parts.

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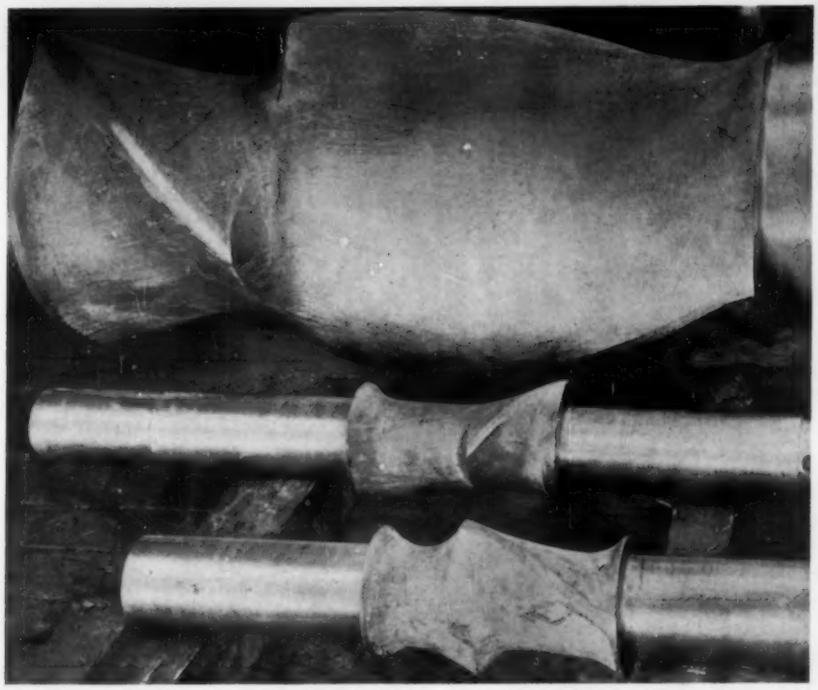

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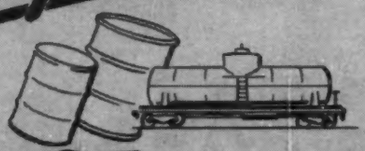

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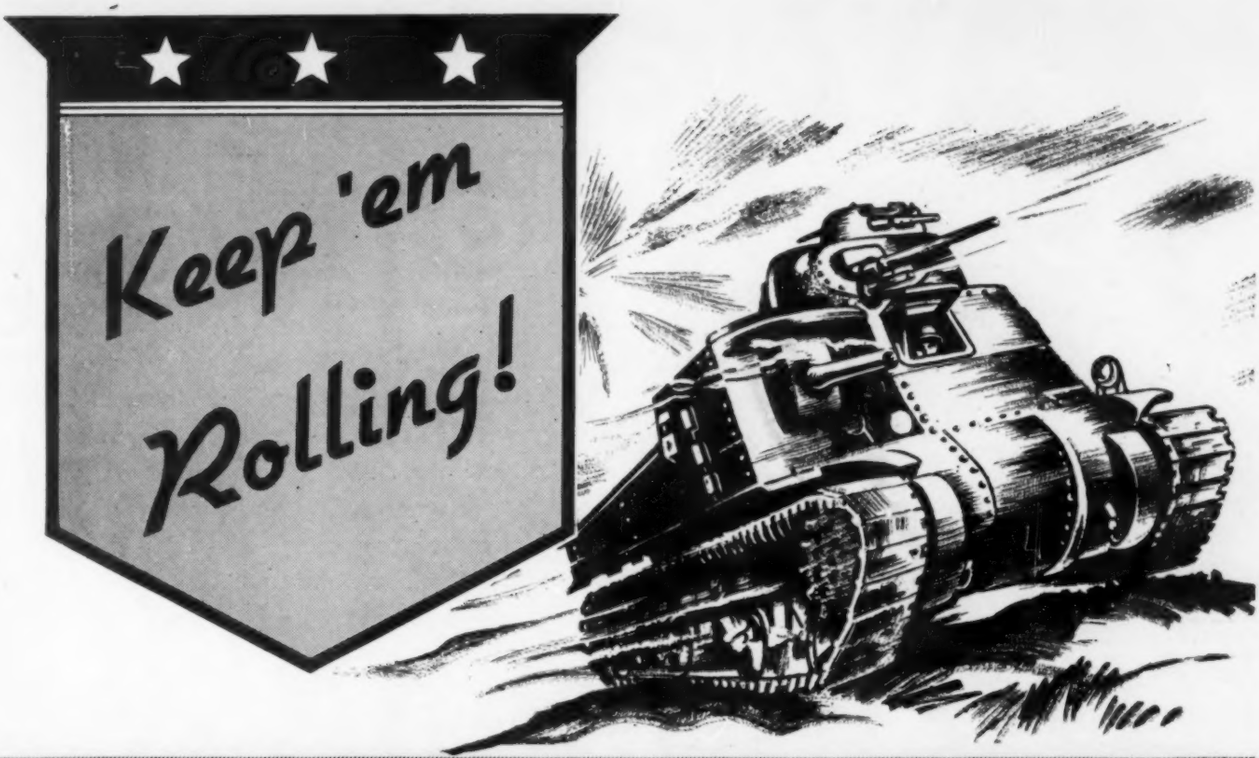

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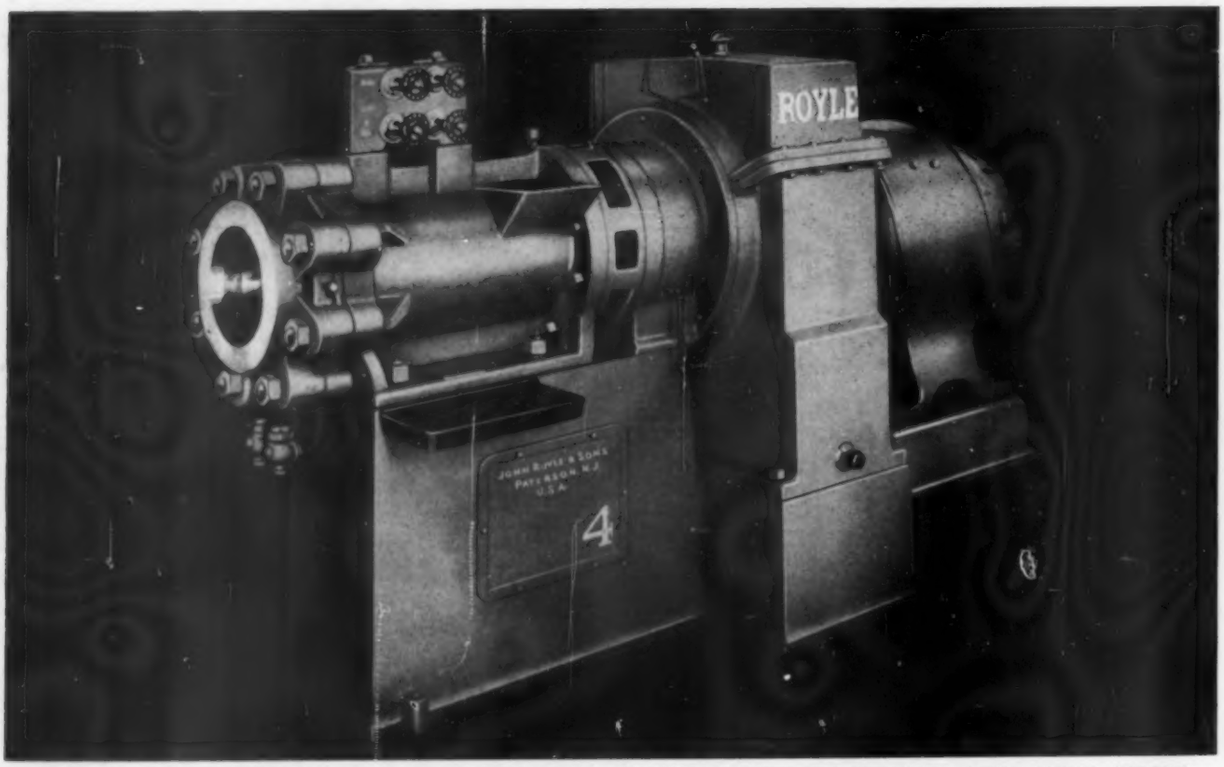

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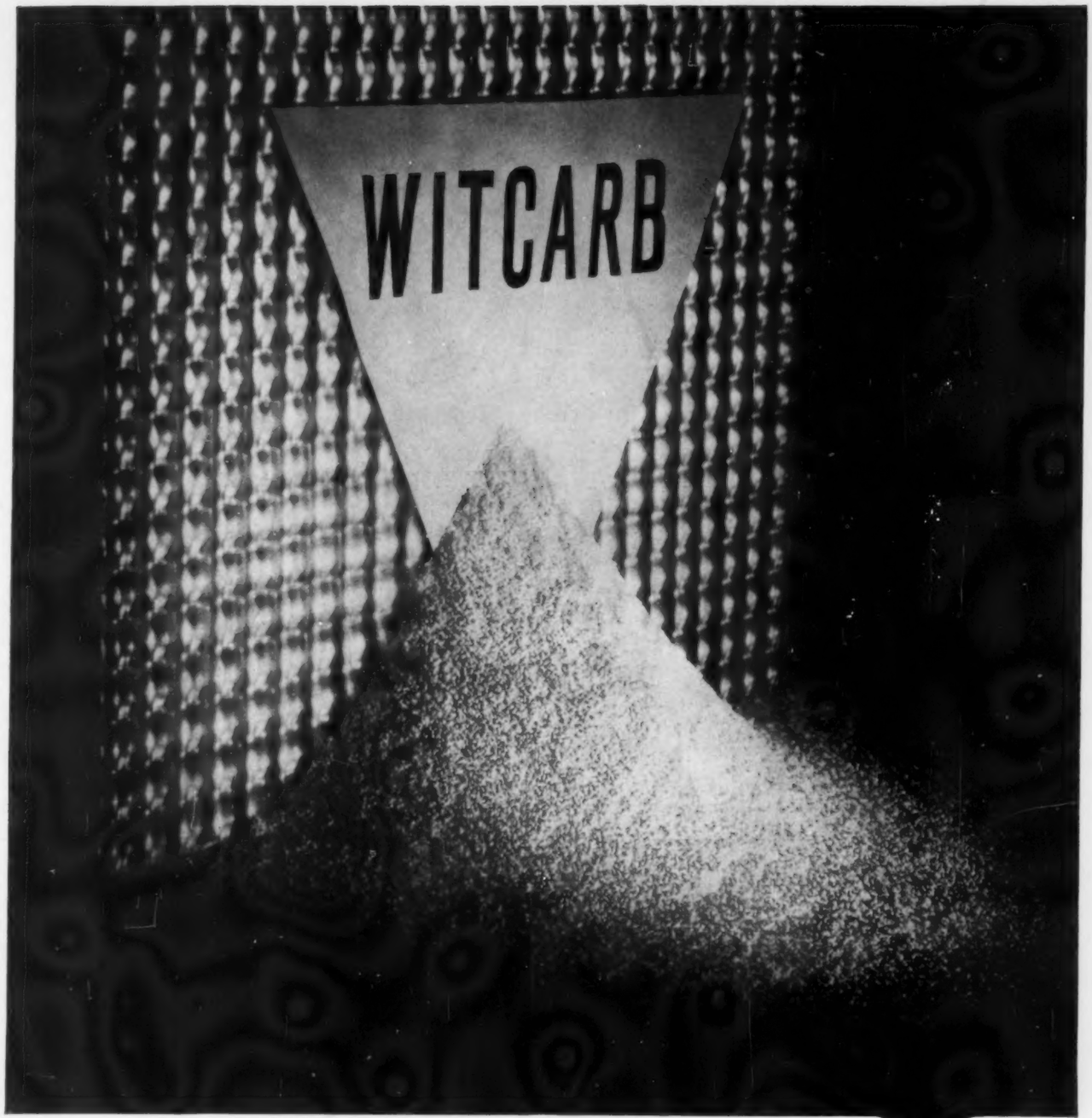

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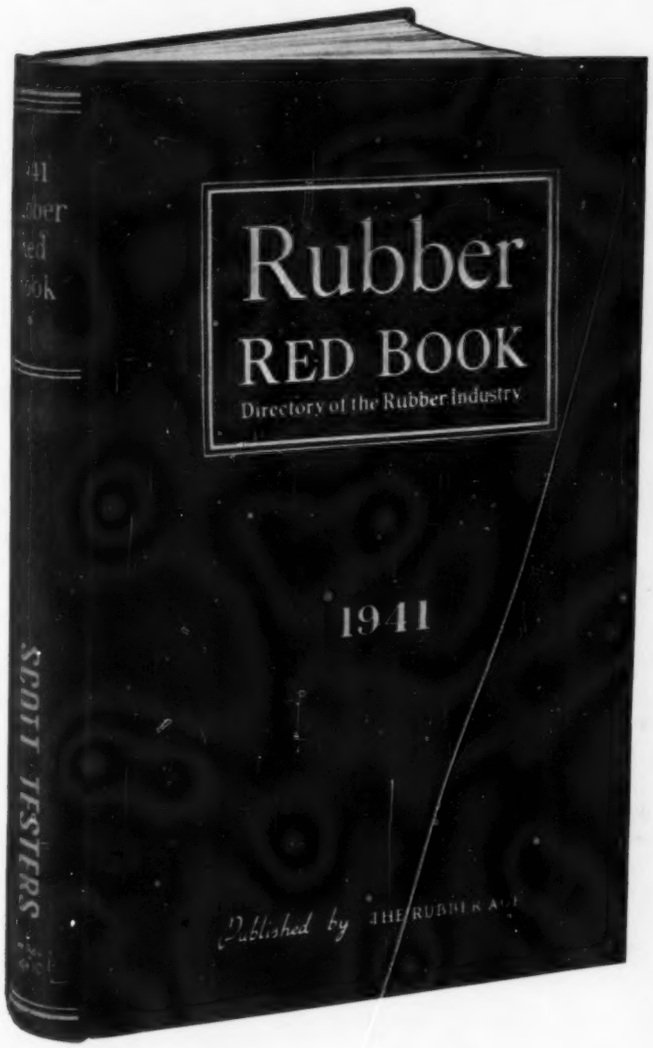

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The INDISPENSABLE REFERENCE BOOK for Rubber Manufacturers, Suppliers, etc....

To rubber factory executives, purchasing agents, technologists, etc., the RUBBER RED BOOK furnishes complete and handy lists of suppliers of all kinds of materials, equipment and services classified for easy reference. This is a service which saves buyers much time and effort as in no other directory are such lists available.

Suppliers and their salesmen, on the other hand, find the RUBBER RED BOOK invaluable for its complete and accurate listing of rubber manufacturers in the United States and Canada with such data as size of company, type of products made, names of buyers and other executives, etc. Also included is a geographical breakdown of rubber manufacturers in the United States showing all companies in each city and town. This feature enables salesmen to be certain that no prospect is overlooked.

No matter what position you hold in the rubber industry—factory executive, purchasing agent, chemist, technologist; supplier of machinery, chemicals, rubber, or other materials; librarian; consultant; salesman or user of rubber products—you should have a personal copy of the 1941 RUBBER RED BOOK on your desk or in your brief case ready to give an immediate answer to the thousand and one questions which crop up constantly, particularly during these critical days when accurate information is so essential.

Summary of Contents 1941 RUBBER RED BOOK

RUBBER MANUFACTURERS IN THE UNITED STATES
Alphabetical Section; Classified List of Rubber Products; Geographical Section.

RUBBER MANUFACTURERS IN CANADA

RUBBER MACHINERY AND EQUIPMENT
Classified List of Machinery; Machinery Manufacturers and Addresses

ACCESSORIES AND FITTINGS
Classified Lists of Products; Suppliers and Addresses

RUBBER CHEMICALS AND COMPOUNDING MATERIALS
Classified List of Materials; Trade and Brand Names; Suppliers and Addresses

FABRICS AND TEXTILES
Classified List of Materials; Suppliers and Addresses

CRUDE RUBBER AND RELATED MATERIALS
Classified List; Suppliers and Addresses

SYNTHETIC RUBBER AND OTHER RUBBER-LIKE MATERIALS

RECLAIMED RUBBER
Manufacturers and Addresses; Methods of Manufacture; Statistics (1919-1940)

SCRAP RUBBER DEALERS

RUBBER DERIVATIVES

RUBBER LATEX
Latex and Latex Compounds; Water Dispersions; Special Latex Processes; Latex Compounding Materials; Latex Machinery and Equipment

MISCELLANEOUS PRODUCTS AND SERVICES
Backing for Camelback; Cork Products, Wax Crayons; Decalcomania Transfers; Scrap Rubber Grinding; Inks for Printing on Rubber; Rubber Labels; Master Batches; Liner Compounds; Liners Processed; Processed Liners; Processed Paper

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TRADE AND TECHNICAL ORGANIZATIONS

WHO'S WHO IN THE RUBBER INDUSTRY

SUBJECT INDEX

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*Patent Applied For

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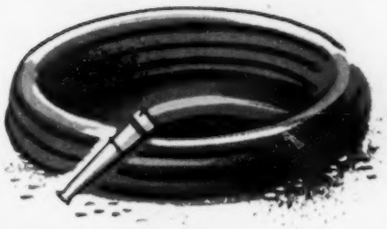

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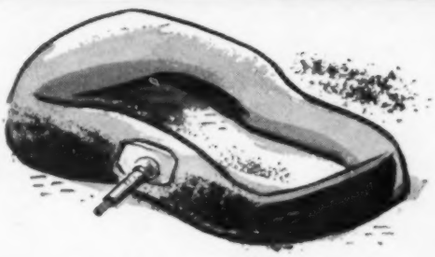

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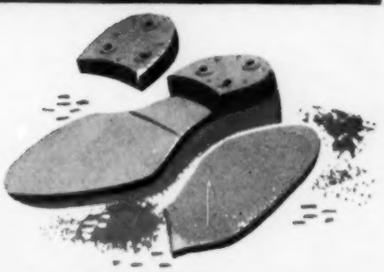

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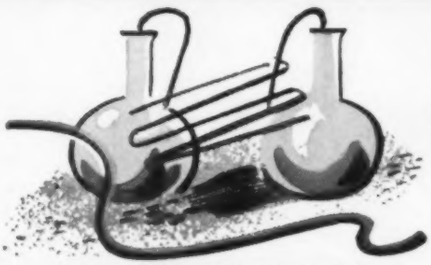

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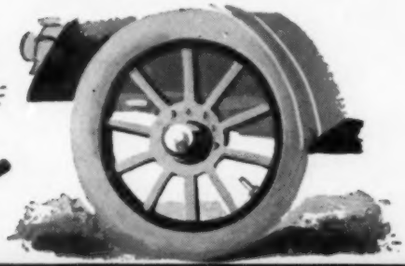

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VOLUME 51
NUMBER 1

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The **RUBBER AGE**

VOL. 51, No. 1 **APRIL, 1942**

Naftolen as a Compounding Material for Synthetic Rubbers of the Buna N Type

By FRITZ ROSTLER and VILMA MEHNER

Wilmington Chemical Corp., Wilmington, Delaware

THE application of Naftolen *(1)* in the manufacture of rubber products from natural rubber has been described in earlier publications *(2)*. The purpose of this article, therefore, is to furnish compounders with a preliminary report and a general description of the usefulness of this product for synthetic rubber of the Buna N type (butadiene copolymer characterized by oil resistance).

Naftolen serves in synthetic rubber, as in natural rubber, as a vulcanizable plasticizer and dispersing agent for carbon black, and as an extender. The possibility of using Naftolen in large proportions is of greater importance with synthetic rubbers, especially those of the Buna N type, than with natural rubber, since the tough synthetics require a high percentage of plasticizer.

As to synthetic rubbers, it is unnecessary to explain in this article the general properties of and differences between the various kinds on the market. A few references are sufficient for those who wish to learn the known facts. For instance: Fisher has described the various synthetics in comparison with natural rubber *(3)*. Sebrell and Dinsmore have compared the properties of various synthetic rubbers *(4)*. The principles of compounding the original Perbunan have been discussed by Klebsattel *(5)*. Wood, some time ago, presented a summary of the knowledge then available in a special circular *(6)*. Schade has made available additional information on natural and synthetic rubbers *(7)*. Properties of typical Hycar O.R. compounds have been reported by Garvey, Juve and Sauser *(8)*. Further valuable information has been made public by the producers of this kind of synthetic rubber *(9, 10)*.

The available knowledge on the principles of compounding Buna N and the experience collected on Naftolen with natural rubber have been utilized in this study.

(1) Trade mark registered in the United States, Canada, and most of the European countries.
(2) *I.R.W.*, **104**, No. 5, 47-51 (Aug., 1941); *Ibid*, **105**, No. 5, 473-77 (Feb., 1942); "Naftolen for Rubber," a booklet prepared by the Wilmington Chemical Corp.
(3) Natural and Synthetic Rubbers, Edgar Marburg Lecture, 1941, "Proceedings of the A.S.T.M.," Vol. 41 (1941).
(4) *I.R.W.*, **103**, No. 6, 37-40; **104**, No. 1, 45-50 (March and April, 1941).
(5) *Ibid*, **102**, No. 5, 33-35; No. 6, 37-39; **103**, No. 1, 45-48 (Aug., Sept. and Oct., 1940).
(6) "Synthetic Rubbers: A Review of their Compositions, Properties and Uses," Circular C427, National Bureau of Standards, Washington, D. C.
(7) Rubbers, Natural and Synthetic, *R.A. (N.Y.)*, **48**, 387-92 (March, 1941).
(8) *Ind. Eng. Chem.*, **33**, 602-606 (May, 1941).
(9) "Compounding Manual for Hycar O.R."; "Softener Study for Hycar O.R."; booklets prepared by Hycar Chemical Co.
(10) "Perbunan Compounding and Processing," booklet prepared by Stanco Distributors, Inc.

TABLE I—SERIES N

Mixture No.	1	2	3	4	5	6	7
Perbunan	100.	100.	100.	100.	100.	100.	100.
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Naftolen R-100	20.	20.	20.	20.	20.	20.	20.
Altax	1.	1.	1.	1.	1.	1.	1.
D.P.G.	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Channel Black	55.	55.	55.	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.	1.	1.	1.
Sulfur	0.	1.	1.5	2.	2.5	3.	5.
Optimum Cure @ 40# (min.)	35	80	60	35	25	10*	25*
Hardness (Shore)	55	55	58	59	60	60	68
Tensile @ Break (lbs./sq. in.)	260	1290	1530	2100	3070	1650	2750
Elongation @ Break (%)	1150	560	425	480	520	480	380

* Overcured

TABLE II—SERIES N/ST

Mixture No.	1	2	3	4
Perbunan	100.	100.	100.	100.
Stearic Acid	....	0.5	2.	4.
Naftolen R-100	20.	20.	20.	20.
Altax	1.	1.	1.	1.
D.P.G.	0.25	0.25	0.25	0.25
Channel Black	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.
Sulfur	2.5	2.5	2.5	2.5
Optimum Cure @ 40# (min.)	35	35	35	25
Tensile @ Break (lbs./sq. in.)	2430	3050	2980	3180
Elongation @ Break (%)	430	500	520	630

Basic Formula

For the sake of simplicity, and in order to facilitate comparison of results, a mixture was used as a basic formula in this examination which can be used as a basic formula for testing all kinds of synthetics as well as natural rubber and reclaim and has been so used in previous publications. The composition of this formula is given below:

Buna N	100 parts by weight
Naftolen R-100	0 to 50 parts by weight
Stearic Acid	to be determined
Sulfur	to be determined
Zinc Oxide	5 parts by weight
Accelerators	1 to 1.5 parts by weight
Antioxidant	optional

Three domestic commercial products were used in this study: Perbunan, sold by Stanco Distributors; Hycar O. R., produced by Hycar Chemical Company; and Chemigum, produced by Goodyear Tire & Rubber Company. Naftolen R-100 was used in the study since it is the standard grade and equally suitable for all compounds investigated. The determination of the amount of stearic acid and the amount of sulfur to be used was one object of this examination. The channel black used was Standard Micronex. The fact that 55 parts of channel black were used has no other significance than that this amount seemed to be practical for an examination of highly plasticized mixtures with various kinds of rubber and that a compound with this loading has a wide range of application. The accelerator combination Altax and D.P.G. was also used in most cases because of the wide range of applicability. Agerite Powder was used in some of the compounds as antioxidant.

Although this study is designed to give data comparable to those available in the literature, the numerical values of the physical data should be considered merely as indicative of the trend. Even within this examination the figures for physical data have quantitative relationship only within one series. In all examinations dealing with synthetic rubber it should be borne in mind that if the synthetic rubbers are not produced on a very large scale a considerable variation in properties between batches is natural. However, this fact should offer no difficulties in the

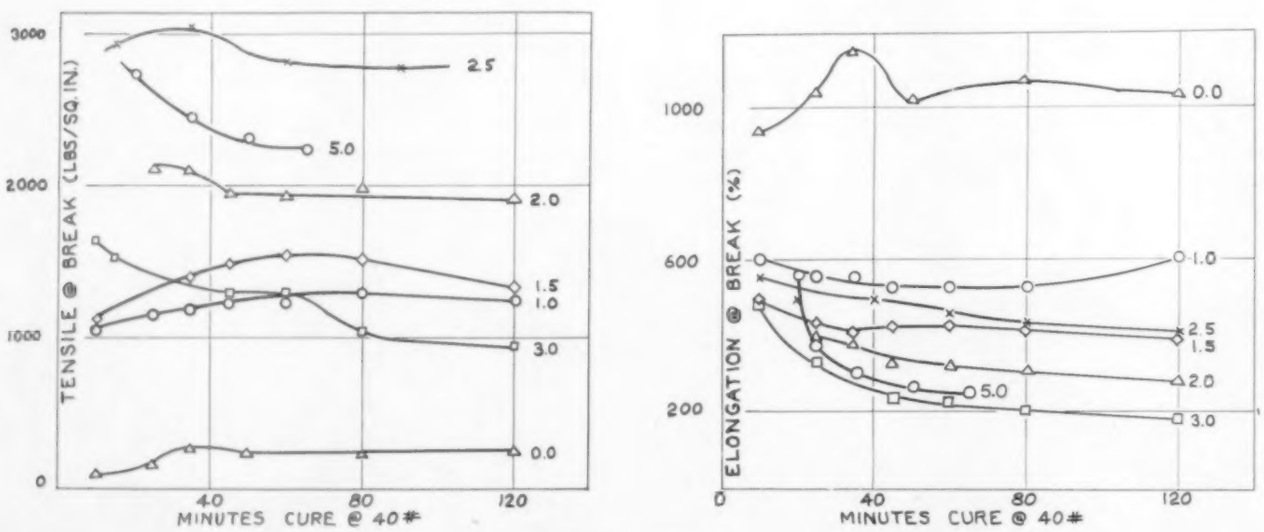

Figure 1—Series N

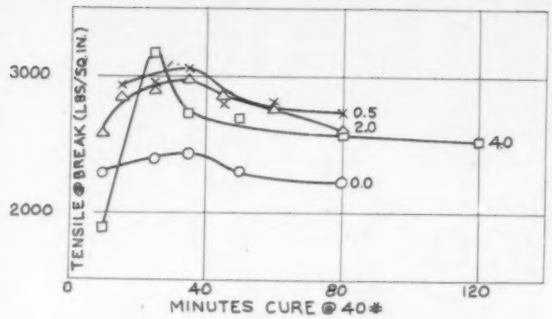

Figure 2—Series N/st

future, since it can be taken for granted that the variations will disappear with the contemplated increased production scale. On the other hand, it is significant that, as will be shown later, the same general principles of compounding hold for all three of the Buna N type synthetics investigated.

Sulfur and Stearic Acid Content

The first requirement in compounding synthetic rubber with Naftolen is to use the proper amount of sulfur to satisfy the demand not only of the synthetic but also of the Naftolen. This means that the sulfur content of the mixture must be increased over the usual recommended amount. Table I and Figure 1 show that for the basic formula with 20 parts of Naftolen R-100 and 100 parts of Perbunan, 2.5 sulfur is the required amount.

The optimum amount of stearic acid was another question of principal importance. The influence of stearic acid on compounds can hardly be over-estimated. Stearic acid serves with Buna N, as with all kinds of rubber, three purposes: activating the accelerator, plasticizing the rubber, and preventing sticking of the mix to the rolls. The intensity of activation with increasing amounts is shown in Table II and more obviously in Figure 2. The curves show that if the cure is to be kept under control, not more than 2 parts of stearic acid on 100 parts of Perbunan should be used. The mixture containing 4 parts of stearic acid tends to get out of control; the curve shows a very small plateau. The mixture containing 0.5 stearic acid shows the best plateau and at the same time a sufficient activation. The plasticizing effect of stearic acid in the presence of Naftolen is negligible. As to the third of the above-mentioned purposes, prevention of sticking of the mix to the mill, observation of the mixing process has shown that 0.5 stearic acid is sufficient.

The conclusion to be drawn from the data in Tables I and II and Figures 1 and 2 (and from the observation during milling) is that the basic formula should contain 2.5 sulfur and 0.5 stearic acid on 100 Perbunan and 20 Naftolen. For a combination of 100 Perbunan and 50 Naftolen the optimum amount of sulfur is 3.5 parts as shown in Table III.

The foregoing series establishes that in compounding 100 parts of Perbunan with 20 parts of Naftolen,

TABLE III—SERIES N-50

Mixture No.	1	2	3	4
Perbunan	100.	100.	100.	100.
Stearic Acid	0.5	0.5	0.5	0.5
Naftolen R-100	50.	50.	50.	50.
Altax	1.	1.	1.	1.
D.P.G.	0.25	0.25	0.25	0.25
Channel Black	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.
Sulfur	2.	2.5	3.5	5.
Optimum Cure @ 40# (min.)	45	45	15	15
Hardness (Shore)	40	42	43	45
Tensile @ Break (lbs./sq. in.)	2100	2530	2560	2000
Elongation @ Break (%)	810	780	860	580

TABLE IV—SERIES H/S

Mixture No.	a	b	c	d	e	f
Hycar O.R.	100.	100.	100.	100.	100.	100.
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5
Naftolen R-100	25.	25.	25.	25.	25.	25.
Altax	1.25	1.25	1.25	1.25	1.5	1.5
Micronex	55.	55.	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.	1.	1.
Sulfur	1.	2.	2.5	3.	4.	2.5
Optimum Cure @ 45# (min.)	80	40	30	20	30	30
Hardness (Shore)	60	64	65	64	64	67
Stress Strain @ 300% (lbs./sq. in.)	720	1040	1090	970	1920	1330
Stress Strain @ 500% (lbs./sq. in.)	1580	2250	2360	2110	....	2870
Tensile at Break (lbs./sq. in.)	2450	2700	2910	2890	3220	3180
Elongation @ Break (%)	640	565	577	610	440	530

TABLE V—SERIES N/S

Mixture No.	1	2	3	4	5	6
Perbunan	100.	100.	100.	100.	100.	100.
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5
Naftolen R-100	5.	10.	15.	20.	30.	50.
Altax	1.	1.	1.	1.	1.	1.
D.P.G.	0.25	0.25	0.25	0.25	0.25	0.25
Channel Black	55.	55.	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.	1.	1.
Sulfur	2.2	2.3	2.4	2.5	2.7	3.5
Optimum Cure @ 40# (min.)	25	20	15	15	15	15
Hardness (Shore)	67	64	60	55	50	45
Stress Strain @ 300% (lbs./sq. in.)	1830	1050	1240	700	600	400
Stress Strain @ 500% (lbs./sq. in.)	...	2200	2720	1770	1500	1800
Tensile @ Break (lbs./sq. in.)	2720	2710	2930	2670	2850	2500
Elongation @ Break (%)	400	570	570	650	720	890

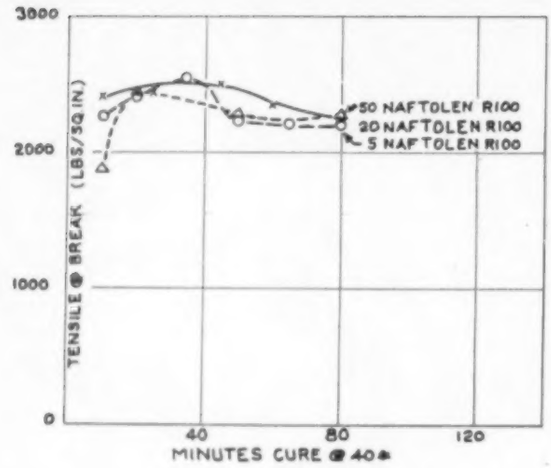

Figure 3—Series N/S/n

2.5 sulfur and 0.5 stearic acid are to be used. The sulfur concentration recommended by the producer for Perbunan is 1.5 to 2.5%. Naftolen requires 4 to 6% sulfur. Considering the fact that Naftolen is an excellent dispersing agent for carbon black, eliminating the formation of lumps and sulfur absorption by these agglomerates, the sulfur demand for the Perbunan itself in Naftolen-containing mixtures can be assumed to be on the lower side of the recommended range, or 1.5%. The optimum of 2.5 parts of sulfur for the mixtures in Table I containing 100 Perbunan and 20 Naftolen is thus in accord with these recommendations. The mixture containing 50 parts of Naftolen on 100 Perbunan shows an optimum with 3.5 parts of sulfur for the mixture, or 4% for the Naftolen, assuming again 1.5% for the Perbunan. This gives a general rule for Perbunan-Naftolen mixtures that 2 to 2.5% sulfur on the total hydrocarbons (Perbunan plus Naftolen) should be used in such mixtures. However, this does not eliminate the necessity of determining the sulfur demand exactly for every mixture.

For the next test Hycar O.R. was used. First a study was made to determine the optimum amount of sulfur for Naftolen-Hycar O.R. combinations. Twenty-five parts of Naftolen R-100 were used in this series rather than 20 parts as with Perbunan because of the tougher nature of Hycar O.R. The principal components of the basic mixture were kept constant and the amount of sulfur varied. In two cases it was necessary to adjust the accelerator. The amount of stearic acid used was 0.5 parts. The results are presented in Table IV.

Considering both the tensile and the elongation, the optimum amount of sulfur seems to be between 2.5 and 3 parts of sulfur for 100 parts of Hycar O.R. and 25 parts of Naftolen R-100, or between 2 and 2.5% of the total hydrocarbons (Hycar plus Naftolen). This indicates that the sulfur demand for Hycar O.R.-Naftolen mixtures is the same as for Perbunan-Naftolen mixtures.

Naftolen Content

Table V gives the data for the basic formula with increasing amounts of Naftolen. It is remarkable that the variation in tensile strength up to 50 parts of Naftolen on 100 Perbunan is negligible. The elongation increases gradually with increasing amount of Naftolen, as is to be expected. The change in hardness is also logical. These figures show the usefulness of Naftolen as a plasticizer and extender for Perbunan. High percentages of Naftolen can be incorporated in Perbunan mixtures to obtain any desired elongation and hardness without detrimental influence on tensile strength.

Amounts of Naftolen over 30 parts on 100 parts of Perbunan in this formula exhibit some bleeding out of the cured stock. However, there is reason to believe that this has a good influence on the life of the finished rubber goods. As a matter of fact, it seems advisable in many cases to use a concentration of Naftolen such that slight bleeding of the cured stock is obtained. Exhibition samples of various synthetic

TABLE VI—SERIES N/S/N

Mixture No.	1	2	3	4	5	6	7	8	9
Perbunan	100.	100.	100.	100.	100.	100.	100.	100.	100.
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Naftolen R-100	5.	....	....	20.	....	....	50.	....	....
Dibutyl Phthalate	....	....	5.	....	....	20.	....	....	50.
Pine Tar	....	5.	....	....	20.	....	....	50.	....
Altax	1.	1.	1.	1.	1.	1.	1.	1.	1.
D. P. G.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Channel Black	55.	55.	55.	55.	55.	55.	55.	55.	55.
Zinc Oxide	5.	5.	5.	5.	5.	5.	5.	5.	5.
Agerite Powder	1.	1.	1.	1.	1.	1.	1.	1.	1.
Sulfur	2.2	2.2	2.2	2.5	2.5	2.5	3.1	3.1	3.1
Optimum Cure @ 40# (min.)	35	35	35	20	20	20	20	35	20
Hardness (Shore)	70	70	70	60	62	59	42	55	45
Stress Strain @ 300% (lbs./sq. in.)	2120	1930	2240	940	680	1220	480	420	590
Stress Strain @ 500% (lbs./sq. in.)	....	....	....	2020	1500	....	1120	740	1300
Tensile @ Break (lbs./sq. in.)	2570	2540	2490	2480	2180	2120	2430	1420	1300
Elongation @ Break (%)	350	370	325	520	650	440	775	747	500

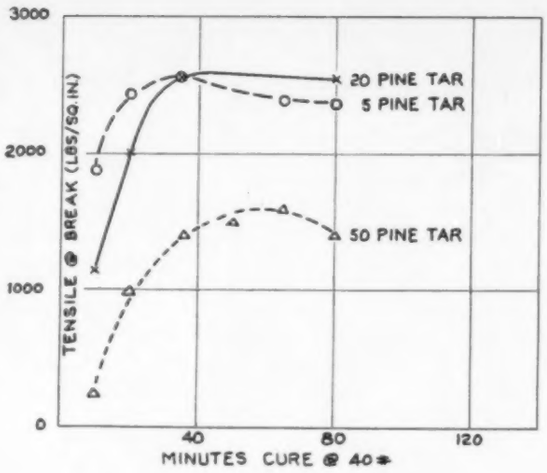

Figure 4—Series N/S/n

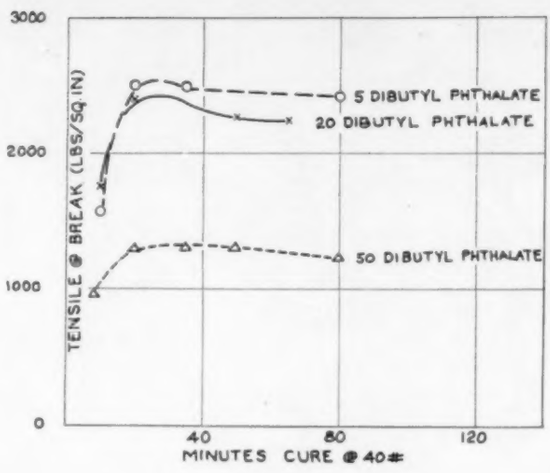

Figure 5—Series N/S/n

rubbers in which there was some bleeding retained their original appearance after being handled for a period of years.

It is worth mentioning that Naftolen-Buna N compounds show a very small change in volume exposed to the swelling test in oil or gasoline.

In order to compare the influence of Naftolen on tensile and elongation with that of pine tar and dibutyl phthalate, three series of mixtures were made. Table VI and Figures 3, 4, and 5 represent the results of this examination.

The fact that Naftolen up to 50 parts on 100 parts of Perbunan does not reduce the mechanical strength of a channel black compound has been confirmed; whereas the tensile strength drops off considerably if 50 parts of dibutyl phthalate or pine tar are used. It was observed during the mixing operations that the incorporation of carbon black is greatly facilitated by the use of Naftolen, giving an excellent dispersion.

These series of mixtures demonstrate that Naftolen is a suitable plasticizer for Perbunan mixtures containing carbon black, serving at the same time as an extender.

(To Be Continued)

Agricultural Experiments Give Promise Of New Rubber Extender

THE early production of a new type of rubber extender, derived from vegetable bases, was indicated in a talk given by Henry G. Knight, chief of the Bureau of Agricultural Chemistry & Engineering of the Department of Agriculture, at the Eighth Annual Chemurgic Conference, held in Chicago on March 25. An abstract of Dr. Knight's talk follows:

From dipentene (derivable from turpentine) is now being made a chemical known as isoprene which is valuable as a synthetic rubber intermediate. In the present acute rubber shortage, all possible synthetic rubber intermediates are of great potential value. Isoprene is not the only derivative of turpentine that might serve to supply such intermediates. Recently the Bureau reported on experiments with thermal isomerization derivatives of turpentine, comprising conjugated chain trienes which also have potentialities in the synthetic rubber field. These also show interesting possibilities in the drying oil and synthetic resin fields.

And, of course, you know from what you have seen in the papers that we are working on synthetic rubber in one of the laboratories. I can't tell you much about that project because it is of a confidential nature. I can tell you that our most promising prospect is in the production of what scientists call a rubber extender. By mixing this material with natural rubber from the rubber tree or from the guayule plant which the Bureau of Plant Industry and the Forest Service has been asked to develop in this country, we can extend or enlarge the amount of commercial rubber that can be produced from natural rubber. We'll soon be in pilot-plant production of this new rubber extender which can be made from one of our widely produced farm crops.

With the rubber situation as it is, it seems to me that we should encourage the development of rubber trees in South and Central America, the development of the guayule plant in this country, as well as the development of synthetic rubber and rubber extenders. After these sources have been developed industry will select the ones that are the most economically practicable for commercial production. And we should push all of these projects as fast as possible in the hope of soon finding something that will prevent the civilian population from having to do without rubber.

A New Method for Extending the Volume of Latex

By P. M. FLEURIEL
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EVER since Hevea latex was made commercially available, it has been the object of many research men to find the secrets of modifying its natural characteristic so as to multiply its applications. To those facing the present task of developing substitutes, the intricacies of this natural product seem, no doubt, more complex than ever. The art of compounding latex up to a short time ago was directed more towards obtaining specific results without thought of how much latex was needed except insofar as the economics of the problems were involved.

Problems of Modifying Latex

The efforts made to modify latex, either normal or concentrated, were involved with such problems as surface tension, pH, viscosity, film characteristics, adhesion, vulcanization, etc. The solution of any latex problem usually required consideration of several of the above mentioned, and the choice of materials which the chemist had at his command to vary these properties was extensive if not unlimited. The literature is replete with comprehensive information.

We are now confronted with a diminishing basic material so that the whole art of compounding latex is being reoriented towards one main goal; namely, the extension of latex. It must be remembered that at no time has the latex chemist ever had the flexibility of the rubber chemist, for the latter has an old but invaluable tool at his disposal—the rubber mill. Therefore, it follows that the advances to be made in the extension of latex are more arduous and narrower in scope than in milled rubber compounds.

We shall attempt in this article to evaluate compounding agents by their relative worth as extenders of latex, that is, how increasing amounts quickly denature it, both in the liquid phase and in the dry films.

Suitable ingredients which can be readily introduced in latex may be classed as follows: proteins, such as casein, soya bean protein, animal glue, albumen; carbohydrates, such as corn starch and tapioca in modified forms; Karaya and other gums; resins and rosin and its derivatives; a large group of synthetic resins, acrylic, alkyd, and Cumars, etc.; fillers, pigments, asbestine, earths, clays; vulcanizing agents, both for room temperature and heat curing.

Proteins incorporated into latex give high viscosities as well as high stability and good adhesion but are limited in use when judged by the standard. Beyond 10%, based on dry rubber, the film decreases in elasticity, is tack free, tends to become horny, while the wet film is slow to dry, no longer sets quickly; and if a low viscosity is required, the solids must be reduced markedly.

The various starches and their derivatives, although more difficult to use, can be introduced in greater ratios; but they, too, have definite limitations, for in excess brittleness appears and elasticity diminishes rapidly. This group is of benefit perhaps in the lower concentrations. But at best starches cannot be considered true extenders, for beyond 20% extension the films are so denatured that their use is of limited interest.

We find that resins, both natural and synthetic, in the form of dispersions, offer a large scope of study when applied in terms of extending latex. Rosin and its derivatives are interesting because of cost; but except in special applications the effect on rubber is destructive, and where age resistance is necessary they must yield to the larger synthetic group. Prepared dispersions of standard synthetic resins are now offered at various concentrations and also in many cases at attractive prices. It is not the purpose of this article to examine the individual merit of these dispersions, but it may be pertinent to realize that their applications in conjunction with latex came to the manufacturers as an afterthought and, therefore, were not primarily developed with this use in view. It is only natural that they, as a group, do not go far enough in extending the natural properties of rubber. For few technicians other than latex chemists are confronted with problems of softness, elasticity, tackiness, adhesion, non-foaming, filming, aging, drying speed, etc., on one problem.

Lack of Diluting Agents

Vulcanization of latex needs neither introduction nor praise for it has increased tremendously the scope of applications; but from our present point of view there is a lack of diluting agents which would also be subject to vulcanization and thereby act as true extenders.

It seems, therefore, proper at this time to focus our attention on a group of products which are produced on a commercial scale and which have been developed by latex chemists for latex users. They are the result of several years of assiduous work, and their presentation at this time has been hastened by our national emergency. Their present stage is not the ultimate

and will require more research, but the interest lies in that enough information is now available to permit the solution of many problems in terms of making one pound of rubber (as latex) do more work.

This group of products was developed by the Union Bay State Company and are sold under the name of PR extenders. The base from which the extenders are made is a hydrocarbon chosen after prolonged search for its low specific gravity which after suitable polymerization is ready for dispersing. It is insoluble in water but soluble in the current aromatics, ketones, and esters, and resists the action of both acids and alkalies to a marked degree. Although it is not a resin in the true sense of the word, it may be compared to one in that it is thermoplastic but at the same time exhibits novel characteristics as will be shown later.

The first requisite for a good compounding agent for latex is fineness and uniformity of particle size. On this property will depend the clearness and smoothness of the film. Another prerequisite is that the particles should act as integral parts of the latex globules rather than as inert fillers, whereupon the strength of the rubber will not be decreased as rapidly. The latex user must also study the liquid phase even before considering films; therefore, low viscosity for high solid content, non-foaming, and drying speeds must be in keeping with those of latex.

The problem of dispersing the PR-Series was solved by a suitable technique involving special equipment which would yield dispersions of at least 40% solids with low protective colloid concentrations. Well known resins, such as the low melting Cumars, can be dispersed with ease with 20% of soap such as triethanolamine oleate. However, the introduction of a large amount of soap not only denatures the dry film as to water resistance for instance, but causes foaming of the compound to a point which renders it impractical for many machine applications. The high soap content retards the setting of a latex compound as well as its drying, and prevents acid coagulation from taking place as rapidly as in latex alone. This is of importance where organic acids are used to speed up the setting of films, such as in the dipped goods industry.

The minimum quantity of dispersing agent required is below 5%, based on the solids dispersed, so that in a 40% concentrate the solution of the agent is less than 2%. This small amount is on the order of the water solubles found in latex.

The study of the formulation, along with a suitable technique, was one of the most difficult phases of the whole development and required an experimental survey of a large number of dispersing agents and soaps in various proportions. One of the interesting groups of observations was the effect that the dispersing methods had on the particle size. Even though stable dispersions were obtained with a number of agents, the fineness varied over quite a range, from a heavy, coarse, dispersed phase which would ultimately settle in a soft paste to a very fine one which would cream in a similar manner to latex. A stable equilibrium was obtained only after polymerizing the base at the desired degree whereupon the dispersed phase stayed indefinitely in uniform suspension.

When incorporated in latex on a dry basis of six parts of rubber to four of PR extender, regardless of concentrations up to 55%, the viscosity of the composition was similar to that of latex alone. Its response to wetting out agents and its susceptibility to coagulating agents were also quite similar.

Further experiments proved that this new extender could be handled as latex in conjunction with latex, and when compounded with proteins, starches, fillers, etc., was practical in the fields of coatings, adhesives and combining; and except for limits of extension, due to specific applications, the latex had been extended 40 to 70%. In certain instances where little elasticity was required 300% had been reached. This last figure should not be counted on by the majority of consumers because it is the exception rather than the rule that a set of circumstances would allow such a reduction of rubber.

The survey of the possibilities of the PR-Series would not have been complete without investigating the effect of vulcanization on PR-latex mixtures. For basis of comparison, we chose PR-130, a PR-latex compound of 55% concentration, which has the following formula having rubber extension of 67%:

Rubber as 60% Latex	2.72 lbs./per gallon
PR	1.80 lbs./per gallon

	A	B	C	D
Rubber as 55% Latex	100.			
PR-130 @ 55%		100.	100.	100.
Zinc oxide	1.	1.	0.67	1.
Sulfur	1.	1.	0.67	2.
Butyl Zimate	1.	1.	0.67	1.

PHYSICAL PROPERTIES

Stress @ 500% (S)—Tensile (T)—% Elongation @ Break (E)

Hot Air Cures at 200° F.	A			B			C			D		
	S	T	E	S	T	E	S	T	E	S	T	E
10 min.	165	4140	1035	70	625	1160	70	70	1290	75	1050	1120
20 min.	200	4850	930	75	1090	1090	70	540	1280	95	1630	1060
60 min.	——	——	——	135	2110	1030	80	940	1015	235	2000	835

The above figures showed that 50% increase in vulcanizing agents in the PR-130 more than doubled the strength of the film. There is also a definite retardation of the cure even in B while in C it is obvious that the curing is progressing at a very slow rate.

% Permanent Set—750% Elongation, Hold 10 minutes—Rest 10 minutes

	A	B	C	D
10 minutes	3	1	3	1
20 minutes	1	1	2	1

In D, where the sulfur was increased, the curing rate was almost proportional to the added sulfur but the tensile remained fairly constant. It must be noticed that in spite of high compounding with PR both B and D developed a good permanent set, and on close inspection the films showed complete uniformity of surface and color when stretched. This characteristic should be of interest for dipped goods manufacturing where not only latex could be saved but such problems as finger strain could be solved by softening the vulcanized latex with a solid which itself takes on a cure.

Naugatex 275 accelerator was used to observe wherein the action would differ:

	E	F
Rubber @ 55%	100.	
PR-130 @ 55%		100.
Zinc oxide	2.	2.
Sulfur	2.	2.
Naugatex 275	1.5	1.5

Hot Air Cures at 200° F.	E S	E T	E E	F S	F T	F E
20 minutes	170	3810	1025	105	1555	1025
30 minutes	235	4620	980	150	1875	980
60 minutes	—	—	—	230	2210	875

The comparison of D and F favors the latter somewhat in that the tensile as well as the curing rate is higher.

Air Cures at Room Temperature	E S	E T	E E	F S	F T	F E
After 3 days	340	1210	1030	90	255	1085
5 days	230	2680	1020	65	200	990
7 days	145	1670	1105	30	125	1010
10 days	170	2640	1090	65	190	960
20 days	200	3400	1130	90	270	1020

The above results on room temperature cures are entirely contradictory to those obtained at 200° F. as far as PR is concerned and from this it can be assumed that heat cures only are worthy of consideration. It is evident, however, that whereas at room temperature Naugatex 275 with high extension of PR does not accelerate the cure, this same accelerator shows very good results under heat. All the work done to date points to the necessity of calculating and considering PR as a vulcanizable product fully as much as rubber itself.

Today, when speed is essential, it is felt that with the cooperation of latex chemists the PR-Series can be made to fulfill its part in the latex emergency. Although the above study may seem incomplete to some, there are definite indications of value even at relatively high latex replacement ratios. These should prove helpful to all users of latex.

PR-Extender is currently produced in three types. PR-130 is a PR-latex compound of 55% concentration. It contains 4.525 pounds per gallon total solids of which 2.72 is rubber and 1.8 is extender. This type is intended for users of concentrated latex where extension is desired but with high solid content. PR-131 is a compound prepared with latex as a base to which has been added PR, the purpose of which is to deposit light films with minimum penetration and maximum extension of latex. As a rule, latex must be added to reinforce it. PR-137 is a dispersion by itself, furnished at 35 to 40% concentration. It is perfectly miscible with latex in any proportion. When PR-130 or PR-131 are to be used, the latex must be furnished to the processor who then returns the complete compound for actual use.

The author wishes to acknowledge his appreciation to the R. T. Vanderbilt Company for the privilege of having various tests made at the company's laboratories.

Calcium Carbonate in Rubber

A STUDY of the effect of fillers on the electrical properties of rubber is currently being made by the National Bureau of Standards at Washington, D. C., in order to arrive at general relations between the properties and proportion of filler and the dielectric constant, power factor, and conductivity of the compounded rubber. The results obtained to date with calcium carbonate are reported by Arnold H. Scott and Archibald T. McPherson in the March, 1942, issue of the *Journal of Research*, published by the Bureau. The system rubber-calcium carbonate presents a relatively simple case for study, because the electrical properties of calcium carbonate do not differ as greatly from those of rubber as do the properties of many other fillers.

The experimental compounds used in this investigation were prepared by incorporating reagent-quality calcium carbonate into two simple base compounds; one consisted only of Vistanex, a synthetic rubber-like hydrocarbon, which was employed without vulcanization; the other was made from natural rubber and was vulcanized by means of tetramethylthiuram disulfide. The calcium carbonate was used in proportions up to about 50 per cent by volume.

It was found possible to express the relation between the dielectric constant and the volume fraction of calcium carbonate by the general relation,

$$\frac{K - K_1}{K + FK_1} = V_2 \frac{K_2 - K_1}{K_2 + FK_1},$$

where F is a constant having the value 2.7; K, K_1 and K_2 are the dielectric constants of the mixture, the base compound, and the calcium carbonate, respectively; and V_2 is the volume fraction of the calcium carbonate. At a frequency of 1,000 cycles per second and a temperature of about 25° C. the natural rubber base compound has a dielectric constant 2.52, the Vistanex, 2.29, and the calcium carbonate, 8.75.

The power factor and the conductivity increase with increasing percentages of calcium carbonate, but do not seem to bear any simple relation to the composition.

General Principles of Compounding with Reclaim

By P. M. ELLIOTT

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The critical shortage of crude rubber, which has resulted in numerous regulations and restrictions imposed of necessity on the rubber industry, has brought reclaimed rubber sharply to the fore. In a paper on "The Position of Reclaimed Rubber in a War Economy," given by Mr. Elliott before the New York Group, Rubber Division, A.C.S., on March 20, 1942, he quoted figures proferred by government officials emphasizing the gravity of the situation, mentioned the three major methods of reclaiming rubber (heater, acid and digester processes), and by means of colored slides traced the manufacture of reclaimed rubber as practiced by Naugatuck Chemical. The concluding portion of his talk was concerned with the general principles to be observed in compounding with reclaim. This portion of the talk is being reproduced herewith.—Editor.

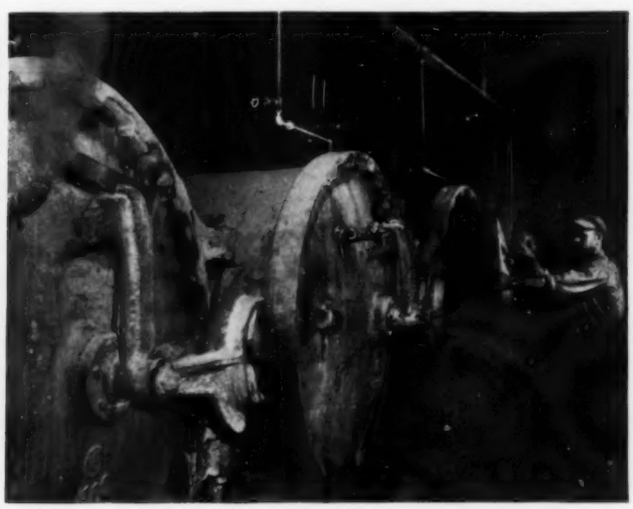
THE problem of compounding is of great importance in the use of reclaimed rubber. It is not within the scope of this paper to go very deeply into compounding problems, but there are certain general principles which can be considered profitably.

Basically reclaimed rubber is like crude rubber. It cures with sulfur, requires accelerators for rapid curing, is protected by antioxidants, and reacts as expected to loadings of reinforcing or inert fillers. One should always keep in mind, however, that reclaimed rubber possesses all these characteristics to a different degree than does crude rubber.

To illustrate this, let us consider the steps that a compounder might take to convert an existing formula based on crude to one containing a desired proportion of reclaim. There are, of course, many ways of accomplishing this. The method I am about to outline is one which we feel is relatively simple and quite generally satisfactory. The steps are as follows:

First: He should select a reclaim that is economically and physically suited to the proposed use. This choice involves many factors which we can consider more fully in a few moments.

Second: On a rubber hydrocarbon basis he should replace as much as desired of the crude in his formula by the chosen reclaim. That is to say, one should not expect to replace 30 parts of crude in a formula by 30 parts of a reclaim containing only 60 per cent rubber hydrocarbon but should use 50 parts of the reclaim.



The chopper at the left is one of the largest of its kind and is wide enough to take any passenger-size tire. The tires are fed into the machine by the toothed feeder roll in the center. Devulcanizers, one of the most important pieces of equipment in the reclaiming process, are seen at the right. These photos were taken in the Naugatuck Reclaiming Plant at Naugatuck, Conn.

It is usually satisfactory to consider crude as 100 per cent rubber hydrocarbon, although we know it is not. The rubber content of the reclaim is generally furnished by the reclaim manufacturers. In the past there has been some disagreement as to how "rubber content" should be determined. It is calculated by difference, *i.e.*, the other constituents of the mixture are determined and the unaccounted for portion is considered to be rubber. At present the practice is becoming more uniform and correction is applied for the carbon black and cellulose in the reclaim as well as for extractibles, moisture, combined sulfur, and ash.

Third: Since reclaimed rubber is nearly always faster curing than crude, the acceleration of the compound should be reduced or modified to take advantage of this feature.

Fourth: Adjustment should be made for the fillers, reinforcing agents, and zinc oxide available in the reclaim used. Carbon black or clay in the reclaim will contribute towards hardness and abrasion resistance in the cured product. Inert filler which is in the reclaim will in general function much like the same filler added to the mix. If zinc oxide is present in the reclaim in large amounts it is available not only for the curing of the reclaim but also to a certain extent for curing of new rubber added to the mix. It is to be noted, however, that a certain amount of new zinc is generally necessary to give stocks which age well. To avail himself of the compounding ingredients present in the reclaim, the compounder should substitute the reclaim for the crude on the hydrocarbon basis and then progressively reduce the loading or zinc content of his formula to give him the desired properties in the finished product.

Fifth: Reclaimed rubber may materially alter the processing properties of the compound. This change in properties should be studied for it has in very many cases, particularly with calendered or extruded goods, been found worthwhile in processing to add some reclaim to the mix.

Selection of the Best Reclaim

Now let us return to the problem of the selection of the best reclaim for the job. This is always important and is especially so today when it is desired to get the most value from our reclaim. The properties of reclaims vary over wide limits and various types may overlap in characteristics.

On the basis of the type of scrap going into the reclaim the following generalizations can be made:

Auto Tube reclaims are likely to be "nervy" in processing but will give "rubbery" cured stocks with good tensile.

Whole Tire reclaims are flat processing, that is, they show relatively little shrinkage or distortion after calendering or extruding operations. They give stiffer cured stocks showing good aging and abrasion resistance with moderate tensile.

Carcass reclaims are flatter than tube reclaims and give "rubbery" cured stocks with moderate tensile and aging characteristics.

Tread reclaims give excellent resistance to abrasion and good aging with, of course, relatively hard, stiff cured stocks.

Shoe reclaim is very flat and calenders well but generally has a high specific gravity and low rubber content with correspondingly low tensile.

Superimposed on the above characteristics will be those conferred by the reclaiming process. For the most part it is not important whether a reclaim has been devulcanized or digested since proper variations of either process can be made to yield nearly all classes of reclaim. But both processes can be run by alkaline or acid procedures and this change does materially alter the character of the reclaim. If I may generalize again:

Alkali reclaims tend to be nervy and fast curing. They give snappy high tensile cured stocks. The finished reclaim is usually alkaline.

Acid reclaims are flatter and slower curing. They give less trouble in scorching and are widely used in tubed and calendered goods. They are likely to give lower tensiles. The finished reclaim is generally neutral.

In any class of reclaim we can make the additional statement that high gravity stocks, particularly those which have been built up by the reclaimer through addition of filler, will be flatter and smoother than a similarly well refined stock of lower gravity.

With all of these variations and their combinations it must be apparent that the specifications of available reclaims should be carefully examined before a choice is made for a specific use. The large reclaim manufacturers all make a relatively complete line of reclaims and have types which they recommend for certain applications. The recommendations will help in making selections and in special cases the manufacturers will doubtless be glad to aid in making the choice of reclaim.

At the present time many are wondering how high a proportion of reclaim can be used in various articles. For a number of years the consumption of reclaim has ranged between 25 and 35% of the weight of crude used and the maximum ratio of use was 50% in 1928. This is, of course, the overall figure for the industry and included products made entirely from reclaim and others made entirely from crude. The demand now is for higher and higher reclaim content in many lines, and many products must be made 100% from reclaim. No one can say dogmatically just how high we can go in reclaim content and how little rubber can be used in a given application. Things are being done today which were considered impossible or highly improbable only a few months ago.

Many of the new products may not possess the properties called for by specifications but there are indications that in actual service, which is the only true test, the products will be acceptable.

BUY

☆ UNITED STATES ☆

DEFENSE SAVINGS BONDS and STAMPS

Amendments to Supplementary Order No. M-15-b

Amendment No. 6

Section 940.3 (Supplementary Order No. M-15-b) is hereby amended as follows:

1. By changing subparagraph (a) (6) to read as follows:

(6) "Consume" means to use, process, stamp, cut or in any manner change the form, shape or chemical composition of any Rubber, Latex or Reclaimed and Scrap Rubber.

2. By inserting immediately after subparagraph (a) (6) thereof the following new subparagraph designated (a) (7):

(7) "Reclaimed and Scrap Rubber" means all rubber and products and by-products of rubber commonly known as scrap rubber, whether vulcanized or not and whether or not contained in any mixture or compound, and all rubber reclaimed by any process, but does not include Rubber or Latex as defined in subparagraph (a) (1) hereof, balata, gutta-percha, gutta siak, gutta jelutong or pontianac.

3. By changing paragraph (h) thereof to read as follows:

(h) *Limitation of inventories.* No Person shall purchase or receive delivery of Rubber, Latex or Reclaimed and Scrap Rubber or products thereof, in the form of raw materials, semi-processed materials, finished parts or sub-assemblies, in quantities which shall result in an inventory of such material in excess of a minimum practicable working Inventory, taking into consideration the limitations placed upon the production of Rubber, Latex and Reclaimed and Scrap Rubber products by this Order. An Inventory of Rubber or Latex in excess of a quantity reasonably expected to last not more than sixty days shall be deemed to be in excess of a practicable working Inventory unless otherwise specifically authorized by the Director of Industry Operations or the Rubber Reserve Company. An Inventory of Reclaimed and Scrap Rubber in excess of a quantity reasonably expected to last not more than sixty days shall be deemed to be in excess of a practicable working Inventory unless otherwise specifically authorized by the Director of Industry Operations; provided that this restriction on Inventories of Reclaimed and Scrap Rubber shall not apply to any person engaged in the business of reclaiming rubber.

4. By inserting immediately after paragraph (j) the following new paragraphs designated (k), (l), (m), and (n):

(k) *General restriction on the acquisition of Reclaimed and Scrap Rubber.* No Person shall purchase, accept delivery of or otherwise acquire any Reclaimed or Scrap Rubber for any purpose except for the purpose of consuming the same in the manufacture of any of the products hereinafter permitted by paragraph (l); provided that nothing in this Order shall prevent any dealer in scrap rubber from acquiring Reclaimed and Scrap Rubber in the usual course of his business for the purpose of selling the same to another dealer in scrap rubber or to any manufacturer of rubber products.

(l) *General restrictions on the consumption of Reclaimed and Scrap Rubber.* After March 31, 1942, no Person shall consume any Reclaimed and Scrap Rubber for any purpose except (subject to the provisions of paragraph (d)) one or more of the following:

(1) To manufacture any of the products for which Rubber or Latex may be consumed under the provisions of paragraph (b) and (c) hereof: provided that no Person shall consume any Reclaimed and Scrap Rubber to fill any War Order until he has forwarded to the Rubber and Rubber Products Branch of the War Production Board a report complying with the requirements of subparagraph (b) (1).

(2) To manufacture products of the groups listed in List E; provided that no Person shall consume more Reclaimed and Scrap Rubber during any calendar month in the production of any such group of products than a quantity determined (by weight) as follows:

(i) Ascertain the average monthly consumption of Reclaimed and Scrap Rubber consumed by such Person in the manufacture of products of the same group during the last three months of the year 1941;

(ii) Add to the amount so ascertained an amount equal to 166⅔ per cent of the amount (if any) of the average monthly consumption of Rubber and/or Latex by such Person in the manufacture of such group of products during such three months' period;

(iii) Multiply the amount determined pursuant to subparagraph (ii), above, by the appropriate percentage, for each group of products being that set forth in List E opposite the heading of such group.

(3) To manufacture products of the groups listed in List F; provided that no Person shall consume more Reclaimed and Scrap Rubber during April, 1942, in the production of any such groups of products than a quantity determined (by weight) as follows:

(i) Ascertain the average monthly consumption of Reclaimed and Scrap Rubber consumed by such Person in the manufacture of products of the same group during the last three months of the year 1941;

(ii) Add to the amount so ascertained an amount equal to 166⅔ per cent of the amount (if any) of the average monthly consumption of Rubber and/or Latex by such Person in the manufacture of such group of products during such three months' period;

(iii) Multiply the amount determined pursuant to subparagraph (ii) above, by 60 per cent.

Provided further, that beginning May 1, 1942, no Person shall consume any Reclaimed and Scrap Rubber for any such purpose without the prior approval of the Director of Industry Operations.

(m) *Limitation on consumption of Reclaimed and Scrap Rubber during March, 1942.* No Person shall consume Reclaimed and Scrap Rubber during that part of the month of March, 1942, remaining after the effective date of this Order, in making any product, whether set forth in Lists E and F or not, at a rate in excess of his consumption of Reclaimed and Scrap Rubber in making similar products during the corresponding portion of the month of February, 1942.

(n) *General restriction on the destruction of certain rubber articles.* No Person shall, unless expressly permitted by the Director of Industry Operations, destroy by burning or any other means, all or any part of any tire, tire casing or tire tube, or any waterproof footwear, heel, sole, hose, belting or storage battery box, whether worn out or not, which is composed in whole or in part of any kind of rubber (including but not limited to Rubber and Latex, as defined in paragraph (a) hereof, scrap rubber, reclaimed rubber and synthetic rubber), except in the following cases:

(1) The consumption of any such article by any manufacturer of rubber products as a necessary incident to his manufacturing operations.

(2) The consumption of any such article by any Person engaged in the business of reclaiming scrap rubber as a necessary incident to such reclaiming operations.

(3) The destruction of any such article (without destroying the rubber therein) for the purpose of selling its component parts to any Person engaged in the business of reclaiming rubber, or to a dealer in scrap rubber for resale by him to a Person engaged in the business of reclaiming scrap rubber.

This Order shall be effective as of the date of its issuance.

Issued this 20th day of March, 1942.

J. S. KNOWLSON
Director of Industry Operations

List E

Group 1 — 50%

Heels, heel bases, soles, soling strips, taps, toplifts, top-lifting material (black only).

Group 2 — 50%

Insoles, midsoles, welting, box toes, shoe bottom fillers, shoe tapes, rope soles.

Group 3 — 100%

Rubber-soled fabric-top footwear, without heels (black soles, toe caps and foxings only), provided that no reclaimed and scrap rubber shall be consumed in the manufacture of any products in this Group after May 31, 1942.

Group 4 — 30%

Hose (including water, garden, low pressure spray, curb line and garage air, car heater, automotive radiator and fire extinguisher tubing, and other hose not permitted in List "A").

Group 5 — 50%

Friction tape.

Group 6 — 30%

Erasers (except pencil plugs and pencil caps).

List F

Group 1—Automotive parts (including only weatherstrip and channel filler, tail pipe supports, battery drain tubes, brake boots, nipples for high-tension wiring).
Group 2—Containers for automotive SLI batteries (S.A.E. Group 4 and larger and motorcycle types only).
Group 3—Automotive storage battery covers, vents, gaskets and bushings.
Group 4—Automotive fan belts.
Group 5—Typewriter platens and business machine rolls.
Group 6—Parts for business machines (except platens and rolls).
Group 7—Parts for refrigerators, washing machines and motor-driven electric appliances.
Group 8—Stamp pad cushions.
Group 9—Plumbers' suction cups.
Group 10—Adhesives, gaskets and compounds for sealing bags and bagging, packages, drums and pails.
Group 11—Barrel lining.
Group 12—Crutch tips and pads.
Group 13—Brush-setting compounds.

List G

(Products in this list are not considered essential or have been disallowed because there are satisfactory substitutes. Processors have been requested not to submit appeals on these items.)

Advertising novelties; arm rests; artificial flowers; artificial leather; ash trays; aprons, mats, mud flaps and running boards for passenger automobiles, buses, trucks, and tractors; baby carriage tires; bags, packages and containers, except as adhesives or sealing compounds; bath caps, sprays, sponges, mats, pillows and soap dishes; billiard cushions; blackout paint (except shatterproofing material); blowout patches, boots, reliners, made from scrap tires and tubes; buttons; car diaphragms (vestibule); carpet cushion; chair cushions, upholstery and mattresses; chair and furniture parts, including casters and caster cups; Christmas tree ornaments and accessories including wire; cigar and cigarette holders; coasters; coin mats; contraction joint seals and concrete filler; cosmetic applicators; croquet balls.

Desk sets; desk and chair protective pads; dish drainers; door and window wedges, checks and bumpers; door knob covers; dress shields; electric base plugs; fan bases; faucet caps; feeding bottle caps and covers; finger pads; flooring, tile and tiling and wainscoting (except conductive); fly paper; fly swatters; foot bath trays; gambling and coin-operated amusement devices; gasoline curb pump hose; golf bags, driving mats and tees; hairpins and hair curlers; handle grips (except for dielectric purposes); hard rubber photographic trays and development tanks (except X-ray); household gloves; ink wells and bottles; jar openers; kneeling pads; lamp shades; lawn mower tires; link mats; mats and matting (except switchboard and conductive); material for retreading tires and tire casings, except as permitted by specification and/or order of the War Production Board; millinery; molds for casting.

Pacifiers; pedal rubbers; paint brush guards; pan scrapers; paving blocks; pencil plugs and caps; plate wipers; poker chips; quoits; recoil pads for shotguns and rifles; serving trays; signal hose in service stations; sink pads; mats and drain stoppers; sink sprays; skate bumpers or guards; sponge applicators; stair and step treads; steering wheels; stove top pads; swimming tubes and water wings; table tops; teething rings; telephone bases; thermoplastic coatings; toilet seats; tooth, gum and hair massage brushes; toys and parts of toys (except as elsewhere permitted); typewriter keys; typewriter and office machinery silencers; vacuum cleaner tires; wall paper cleaner; washing machine drain hose; weather stripping other than automotive; wheelbarrow tires.

Amendment No. 7

Supplementary Order No. M-15-b is hereby amended by substituting the attached lists designated A, B, C and D for Lists A, B, C and D respectively, now attached to such Order.

This Order shall take effect on April 1, 1942.

Issued this 30th day of March, 1942.

J. S. Knowlson
Director of Industry Operations

List A—Effective April 1, 1942

Group 1—100%

Concentrator belts; industrial brake linings and clutch facings; polishing belts; screen diaphragms.

Group 2—80%

Cleats and bucket pads; last puller belts; pulley lagging; round belts; street sweeper belts.

Group 3—100%

Acid hose; cement gun hose; chemical hose; grease gun hose; hydraulic control hose; jetting and hydraulic hose; railroad hose (all types); rotary drillers' hose; sand blast hose.

Group 4—100%

Air drill hose; dredging sleeves; industrial vacuum hose, oil suction and discharge hose; pneumatic hose; spray hose (for working pressures of 300 lbs. per sq. in. and over); paint spray hose; steam hose; suction hose; welding hose; gasoline and oil tank wagon hose (not including curb pump hose); sanitary hose.

Group 5—30%

Fire and mill hose.

Group 6—85%

Hard rubber pipe and fittings; rubber buckets, pails, dippers, funnels, measures, bottles, beakers, frames, baskets, racks, trays (for handling corrosive materials and explosives); rubber-insulated fume-ducts, fans, racks, frames, trays, screens, pipe, buckets, pails, dippers, agitators, funnels and measures (for handling corrosive materials and explosives); rubber pumps, blower, exhauster and pump lining, valves and parts.

Group 7—80%

Storage battery parts (including only separators, retainers, binding strips, element support rods, tie rods and plate support rods, and hand-built jars and containers, excepting those for automotive starting and lighting batteries); hard rubber sheets, rods and tubing (for dielectric purposes); molded cable connectors and terminal blocks (for dielectric purposes); insulated tools; magneto parts.

Group 8—100%

Mine safety battery parts; mine safety lamp parts; respirators, hose masks, gas masks, goggles, inhalators (mining and industrial types).

Group 9—80%

Chute lining (including lining for sand blast chambers); oil well specialties (packers, testing, lining, bumper and swab rubbers; blow-out preventers; drill pipe protectors; stabilizers; slush pump pistons and liners; mud and oil pump pistons, liners, valves and parts; valve cups; strippers; stuffing box rings); sheet, strip and mechanical packings; vibration dampers (non-automotive).

Group 10—100%

Airplane de-icer parts; card clothing; gaskets and washers (not elsewhere listed) necessary for use with products in lists A, B, C and D; gas main bags; linemen's protective devices (line hose, insulator hoods, blankets, cable end test caps and separators, cable bandages, linemen's sleeves and insulating stools); locomotive drive units; spinning cots; mine venti-

lating tubing; molded, extruded and lathe-cut goods and tubing (not elsewhere listed) constituting component parts of machinery for the processing and fabrication of raw and semi-finished materials and for the transmission of mechanical power; pipe coupling rings; pipe lining discs; shoe diaphragms; stuff pump balls; molded seals for dam and lock gates.

Group 11—80%

Finger print rolls and fingerprint rubber; cutting rubbers; offset and newspaper blankets; printing plates (including cements but excluding rubber stamps, box dies, band daters and toy stamps); printers' rollers; suction cups for printers' equipment; rubber solution for wet plate negatives.

Group 12—40%

Engravers' rubber (including necessary cements but excluding rubber stamps, box dies, band daters and toy stamps).

Group 13—140%

Milk and milking machine equipment, consisting of the following: couplings for pasteurizers and milk bottle and can washers; gaskets for milk separators and clarifiers; milk bottle filler rubbers; milking machine inflations and tubing.

Group 14—160%

Abrasive implements.

Group 15—50%

Automotive Parts, consisting of the following: hydraulic brake cylinder parts, excepting boots; hydraulic brake hose; air brake and vacuum brake parts, excepting boots; air brake and vacuum brake hose; torsional vibration dampers; clutch facings, brake linings and brake blocks; shock absorber bushings; steering post alignment bushings; pitman arm bushings for independent suspensions; steering box-to-frame pads for independent suspensions; windshield wiper blades and pivot to housing gaskets; suspension and torque arm bushings; engine, transmission and propellor center bearing mountings; remote control gearshift bushings; spring bumpers—front and rear; cements and tie-gums (for bonding rubber to metal only); sealed beam gaskets; hydraulic clutch and throttle controls.

Group 16—20%

Automotive fan belts (for trucks, buses, tractors and farm implements).

Group 17—70%

Flush valve balls; washers, including fuller balls and diaphragms, for controlling the flow of fluids; water meter parts.

Group 18—20%

Autopsy and mortuary gloves; net-lined and all-rubber gloves (for handling corrosive and severely abrasive materials).

Group 19—100%

Electricians' gloves (seconds to be used for handling corrosive and severely abrasive materials).

Group 20—100%

Blood pressure bags; brain surgery caps; colostomy outfits; dental separating strips and mouth props; dilators; finger cots (medical, surgical, dental, veterinary and laboratory); inhalation bags and face pieces (medical, surgical, dental, and veterinary); invalid rings; operating cushions; orthodontia bands; parts for medical, surgical, dental, veterinary and mortuary instruments; prostatic bags; rubber bands and cushions for artificial limbs; rubber denture, denture suctions and model formers; tourniquets; tubes, tubing, including catheters, stopples and rubber policemen (medical, surgical, dental, mortuary, veterinary and laboratory); umbilical belts; urinals—individual wear; vaccine caps; X-ray sheets, gloves, aprons and cooling hose.

Group 21—85%

Surgical tape, medicated footpads and plasters.

Group 22—50%

Breast pumps; bulbs (medical, surgical, dental, mortuary, veterinary and laboratory); water bottles and combination syringes; medicine droppers.

Group 23—50%

Hospital sheeting (hospital, ambulance, mortuary and first aid use only); ice bags; metatarsal cushions or pads (not part of shoe); truss pad covers; self-adhering gauze bandages; pneumatic truss pads.

List B—Effective April 1, 1942

Group 1—Compounds for insulating wire and cable.
Group 2—Cable splicing compound (including necessary cement).
Group 3—Conveyor and elevator belting.
Group 4—Belt splicing and repair material.
Group 5—V-belts (non-automotive).
Group 6—Flat transmission belts; hog beater belts.
Group 7—Rubber-lined tanks, drums, pipes and fittings (hard and soft).
Group 8—Rubber covered rolls and roll coverings (except domestic washing machine wringer, printer's, fingerprint and business machines).
Group 9—Press die pads.
Group 10—Loom pickers.
Group 11—Pneumatic, solid and cushion tires and tubes (including flaps, cements, airbags and valves) of the following types: passenger tires and tubes; truck and bus tires; truck and bus tubes; special purpose (including earthmover, road grader and excavator) tires and tubes; industrial tires and tubes (power-driven vehicles only); farm tractor tires and tubes; motorcycle tires and tubes; bicycle tires and tubes; airplane tires and tubes.
Group 12—Camelback, capping stock, filler strip, striping stock, cushion stock, lug stock and base stock for retreading and recapping tires.
Group 13—Full circle airbags and cements for recapping and retreading tires.
Group 14—Vulcanizing materials, patches, blowout shoes, sectional airbags, cements, and similar items for the repair of tires and tubes.
Group 15—Thread for: edging; industrial shoes; belting and flexible metallic hose; repair cords and webs; sanitary belts; supporters (men's athletic); surgical elastic bandage; surgical stockings; surgical supports for abdomen, back and breast; suspensories; trusses (including umbilical belts); webbing for respirators, hose masks, gas masks and inhalators.
Group 16—Container sealing compounds; sealing gaskets (cut rings for commercial packaging).
Group 17—Commercial diving equipment.
Group 18—Rubberized fabric for heating pads.
Group 19—Rubberized fabric for firemen's and policemen's clothing and occupational protective clothing, other than footwear and gloves, consisting of industrial pants, coats, jackets, hose and aprons.
Group 20—Rubber footwear for severe industrial use including rubber boots, mine pacs and work shoes with plain or steel toes.
Group 21—Rubber footwear, other than that provided in Group 20, including rubber boots, pacs, arctics, gaiters, overshoes, rubbers.
Group 22—Nipples (feeding).
Group 23—Pessaries and prophylactics.
Group 24—Surgeons' gloves (medical, surgical, dental and veterinary use).
Group 25—Shoe adhesives for the following operations only: cutting and fitting room operations; bed and side lasting; folding; gem duck; heel breasting; insole rib and lip; moccasin seam; prewelt; platform attaching; rand; soft box toe; sole and bottom attaching; semi-automatic toe lasting; unishank; leather welting; repair.
Group 26—Meteorological balloons.
Group 27—Box die gum, rubber die gum and rubber type gum, all for industrial marking devices only.

List C—Effective April 1, 1942

Group 1—100%

Colostomy outfits; finger cots (medical, surgical, dental, mortuary, and veterinary use); prostatic bags; tubes, tubing, including catheters (medical, surgical, dental, mortuary, veterinary and laboratory use); urinals—individual wear.

Group 2—50%

Inhalation bags and face pieces (medical, surgical, dental, laboratory and veterinary); operating cushions; veterinary sleeves.

Group 3—75%

Flat belts; round belts.

Group 4—15%

Latex insulation for fume ducts, fans, racks, frames, trays, screens, pipes and fittings, buckets, dippers, funnels, measures, drums, pumps, valves, baskets, and agitators (for handling corrosive materials).

Group 5—20%

Industrial rubberized fabric gloves for handling corrosive materials.

Group 6—100%

Electricians' gloves (seconds to be used for handling corrosive and severely abrasive materials).

Group 7—20%

Industrial all-rubber and net-line gloves (for handling corrosive and severely abrasive materials); autopsy and mortuary gloves.

LIST D—EFFECTIVE APRIL 1, 1942

Group 1—Container sealing compounds.
Group 2—Meteorological balloons.
Group 3—Nipples (feeding).
Group 4—Pessaries and prophylactics.
Group 5—Surgeons' gloves (medical, surgical, dental and veterinary use).
Group 6—Shoe adhesive for the following operations only: cutting and fitting room operations; bed and side lasting; folding; gem duck; heel breasting; insole rib and lip; moccasin seam; prewelt; platform attaching; rand; soft box toe; sole and bottom attaching; semi-automatic toe lasting; unishank; leather welting.
Group 7—V-belts (non-automotive).

Amendment No. 8

Sec. 940.3 *(Supplementary Order No. M-15-b)* is hereby amended as follows:

1. By striking out all of Group 14 of List B (as revised effective April 1, 1942) attached thereto and substituting therefor the following:

Group 14: Cushion gum stock, tread stock, tire dough, cord fabric, sectional air bags, repair patches, and cements for the repair of tires and tubes.

2. By inserting at the end of List F attached thereto the following:

Group 14: Tire reliners (except those cut from used or scrap tires or tubes).

This Order shall take effect as of the date of its issuance.
Issued this 11th day of April, 1942.

J. S. KNOWLSON
Director of Industry Operations

Amendments to Supplementary Order No. M-15-b-1

Amendment No. 1

Section 940.5 *(Supplementary Order No. M-15-b-1)* is hereby amended as follows:

1. By changing subparagraph (b) (7) thereof to read as follows:

(7) Tires, tire casings, tire tubes, capping stock and camelback and compounds therefor. List 7.

2. By substituting the attached lists designated Lists 6 and 7 for Lists 6 and 7, respectively, now attached to such Order.

3. By changing subdivision (a) of List 9 attached thereto to read as follows:

(a) Compounds used in the manufacture of tires and tire casings to fill War Orders shall be prepared in accordance with the specifications set forth in subdivision (a) of List 7 attached to this Order as such List may be revised from time to time.

4. By inserting the following new paragraph at the end of subdivision (b) of List 9 attached thereto:

With the types of formulas specified above, and with mold and gauges selected, a manufacturer can calculate the maximum amounts of rubber and whole tire reclaimed rubber which may be used in the manufacture of a tire or tire casing of any specified type and size. Within the maximum amounts of rubber and whole tire reclaimed rubber thus calculated, a manufacturer may, in his discretion, shift the amounts between friction and tread, but may not use in the manufacture of any tire or tire casing more rubber or more whole tire reclaimed rubber than would be used in the manufacture of such tire or tire casing if the above specifications for tread and friction were followed, after allowing for tolerances permitted.

5. By changing subdivision (g) of List 9 attached thereto to read as follows:

(g) Maximum material volumes of tire tubes for passenger automobile tires and truck tires shall be subject to the limitations for those types of tubes as set forth in subdivision (d) of List 7 attached to this Order, as such List may be revised from time to time.

6. By inserting the figure "0" opposite the words "Twist to left—maximum degrees per foot" in each of the columns headed "1½ inch" and "2½ inch" under the heading "Single Jacket" in paragraph (8) of List 10 attached thereto.

7. By inserting the following new subparagraph immediately after subparagraph (b) (10) thereof:

(11) Truck tire flaps. List 11.

8. By attaching thereto the attached additional list designated List 11.

This Order and the specifications set forth in the lists attached hereto become effective on March 23, 1942.
Issued this 25th day of March, 1942.

J. S. KNOWLSON
Director of Industry Operations

List 6—(Revised effective March 23, 1942). *Specifications for the manufacture of water-proof boots, pacs, arctics, gaiters and overshoes.*

(1) All such products shall be manufactured in a black color only.
(2) No rubber shall be used for label plasters.
(3) Production shall be confined to the following types, and the average amount of Rubber per pair used in the manufacture of each type shall not be greater than the indicated maximum weight:

	Average Weight of Rubber (in pounds) Maximum
Boots:	
Men's short	1.25
Women's short	.75
Men's storm king	2.00
Men's hip	2.30
Pacs:	
Men's 12" toplace pac	1.05
Men's lumber overs, half heel	.80

Arctics:	
Men's 5-buckle rubber midweight bal	1.15
Men's 4-buckle rubber midweight bal	1.05
Men's 4-buckle cloth farmweight blucher	.90
Men's 4-buckle height lightweight bal-rubber	.75
Boy's 3-buckle lightweight bal-rubber	.62
Youths' 3-buckle lightweight bal-rubber	.53
Women's 4-buckle height lightweight bal-rubber	.54
Men's 4-buckle lightweight cloth	.65
Gaiters:	
Women's 2-snap or slide rubber	.30
Misses' 2-snap rubber	.30
Child's 2-snap rubber	.27
Rubbers:	
Men's storms and/or semi-storms	.60
Boys' storms	.50
Men's storms and/or S.A. overs (full lined)	.35
Boys' storms and/or overs (full lined)	.30
Youths' storms and/or overs (full lined)	.25
Women's overs (full lined)	.25
Growing girls' storms (full lined)	.27
Misses' storms (full lined)	.20
Child's storms (full lined)	.20
Women's over-toe rubbers	.13

List 7—(Revised effective March 23, 1942). *Specifications for the manufacture of tires, tire casings, tire tubes and capping stock and compounds therefor.*

(a) *Compounds*

Description of Products		*Maximum per cent by volume*	
Type	*Grade*	*Rubber*	*Whole tire Reclaimed rubber*
(1) Tread, capping stock and camelback compounds	A	73	0
	B	59.5	17.5
	C	47.9	31.4
	D	40.4	41.3
	E	26.0	57.0
	F	0	89.3
(2) Passenger friction compound	A	93.8	0
	B	78.0	15.2
	C	59.8	34.2
	D	43.2	50.3
	E	18.8	73.1
	F	0	90.2
	FF	6.4	85.0
(3) Truck friction compounds	A	88.5	0
	B	77.0	9.3
	C+	68.9	24.7
	C	59.8	34.2

Variations from the above specifications are permitted as follows:

Rubber—Plus 0, Minus 2.
Whole tire reclaimed rubber—Plus 2, Minus (not limited).

In the event that no friction compound or tread compound in use by any person on January 26, 1942, contains as large a percentage of rubber as specified above, such person shall not use or adopt the grade A friction compound or the grade A tread compound without the prior approval of the Director of Industry Operations.

(b) *Tire casings and solid tires*

The friction and the tread, respectively, of each of the classes of tire casings and solid tires listed below shall be made from one of the grades of compounds listed in subdivision (a) of this list, the appropriate grade of compound to be used for each such respective friction or tread being that herein below specified therefore opposite the description or designation of such class (provided that in no event shall any such tire herein required to be made of both grade F friction compound and grade F tread compound contain more than one pound Rubber):

PASSENGER FRICTION

Description of Product	*Compounds to be Used*	
	Passenger Friction	*Tread*
(1) Passenger automobile tires, standard grade	F	F
(2) Passenger automobile tires, premium grade, size 7.50 and larger	B	B
(3) Passenger automobile tires, premium grade, size 7.00 and smaller	C	B
(4) Road grader or road builder tires for drop center rims	E	C
(5) Agricultural equipment tires, garden tractor	F	F
(6) Agricultural equipment tires, implements and tractors, size 6.50 and larger	E	C
(7) Agricultural equipment tires, implements and tractors, size 6.00 and smaller	F	F
(8) Agricultural equipment tires, fronts, 6.00 and smaller	F	C
(9) Motorcycle tires	C	A
(10) Mileage tires, taxi	C	C
(11) Industrial pneumatic tires	D	C
(12) Industrial solid tires	—	A
(13) House trailer tires	E	F

TRUCK FRICTION

Description of Product	*Compounds to be Used*	
	Truck Friction	*Tread*
(1) Truck tires, 17-24 inch rims, size 6.50 and smaller	C+	C
(2) Truck tires, 17-24 inch rims, size 7.00, 8 ply and less	C+	C
(3) Truck tires, 17-24 inch rims, size 7.50, 8 ply and less	B	B
(4) Truck tires, 17-24 inch rims, size 7.00 to 7.50, inclusive, more than 8 ply	A	C
(5) Truck tires, for 15 inch flat base rims, 7.50 and larger, more than 8 ply	A	B
(6) Truck tires, 17-24 inch rims, size 8.25 and larger	A	B
(7) Truck tires, 13-16 inch rims, 8 ply and less	C	C
(8) Truck tires, 13-16 inch rims, more than 8 ply, except 7.50 section and larger for 15-inch flat base rims	A	C
(9) Off highway, heavy service tires, 8 ply or less (Road grader or road builder tires for flat base rims, Rock tires, Earth movers, Mud and snow tires larger than 14 inches)	B	C
(10) Off highway, heavy service tires, 10 ply or more (Road grader or road builder tires for flat base rims, Rock tires, Earth movers, Mud and snow tires larger than 14 inches)	A	A
(11) Mileage tires, city busses	B	C
(12) Mileage tires, intercity busses	A	A

With the types of formulas specified above, and with mold and gauges selected, a manufacturer can calculate the maximum amounts of Rubber and whole tire reclaimed rubber which may be used in the manufacture of a tire or tire casing of any specified type and size. Within the maximum of Rubber and whole tire reclaimed rubber thus calculated, a manufacturer may, in his discretion, shift the amounts between friction and tread, but may not use in the manufacture of any tire or tire casing more Rubber or more whole tire reclaimed rubber than would be used in the manufacture of such tire or tire casing if the above specifications for tread and friction were followed, after allowing for tolerances permitted.

(c) *Capping stock and camelback*

(1) Capping stock and camelback shall be manufactured only from compounds of Grade C, as listed in subdivision (a) (1) of this list.

(2) Capping stock and camelback may be manufactured only in gauges of 10/32, 12/32, 14/32, 16/32, 18/32, 20/32, 22/32, and larger.

(d) *Maximum material volume of tire tubes*

No tire tube of any of the classes listed below shall be manufactured with a material volume in excess of the volume specified for such class as set forth below opposite the description or designation of such class:

Description of Product		*Maximum Material Volume (in cubic inches)*	*Description of Product*		*Maximum Material Volume (in cubic inches)*
Type	*Size*		*Type*	*Size*	
Passenger Automobile Tire Tubes	5.50-16	51.2		9.00-20	235
	CD 16	57.8		10.00-20	300
	6.50-15	66.6		11.00-20	350
	7.00-15	72.2		12.00-20	450
	D-16	72		13.00-20	525
	7.50-15	89.4	Agricultural Equipment	14.00-20	670
	7.50-16	93.2	Tires	4.00-12	25.3
	A-20/21	42.8		5.00-15	38.6
	B-17/18	46.9		6.00-9	36.8
	C-17	56.1		6.00-16	59.0
	7.00-17	75.2		DM 16	70.5
	7.50-17	93.4		6.50-32	137.8
Truck Tire Tubes, 15- and 16-in. Rims	6.00-16	65		FM-24	153.5
	6.50-16	75		8.50-10	....
	7.00-15	85		9.00-28	223.0
	7.00-16	89		HM 28	302.0
	7.50-15	103		KM 28	414.0
	7.50-16	108		5-40	92.5
	9.00-16	191		5.5-40	92.5
	10.00-16	220		6-40	118.0
Truck Tire Tubes, 20-inch Rims or Larger	6.00-20	75		7-32	112.0
	6.50-20	102		8-32	157.0
	7.00-20	135		9-32	220.0
	7.50-20	175		10-28	242.0
	8.25-20	197		11-28	302.0
				12-30	385.5
				13-30	440.0
				14-30	498.0
				15-30	595.0

Variations from the above maximum volumes shall be permitted to the extent of minus 3 per cent.

Sizes not specifically set forth shall have maximum volumes proportionate to the sizes listed.

In the event that the maximum volume herein permitted for a tube of a given type and size manufactured by any person on the effective date of this order is less than the maximum indicated above, such person shall make no change in the maximum volume of such tube as then manufactured by him without the prior approval of the Director of Industry Operations.

The foregoing restrictions on material volume of tire tubes do not apply to tire tubes for use with mileage tires.

List 11—(Effective March 23, 1942). *Specifications for the manufacture of truck tire flaps.*

In the manufacture of truck tire flaps to fill all orders, including War Orders, but excluding mileage accounts, the maximum amount of Rubber per flap shall not exceed the amount set forth in the following table opposite the description of each type and size of flap.

Tire Size	*Rim Width*	*Rim Type*	*Maximum amount of Rubber (in pounds)*
6.00-15	4.50	Semi-Drop Center	.65
6.50-16	4.50	Semi-Drop Center	.65
7.00-16	5.50	Semi-Drop Center	.80
7.50-16	5.50	Semi-Drop Center	.80
6.00-16	4.50	Split Wheel	*
9.00-16	5.50	Split Wheel	1.75†
10.00-16	6.50	Split Wheel	1.75†
6.00-20	3.75	Conventional	.60
6.50-20	3.75	Conventional	.60
7.00-20	4.33	Conventional	.85
7.50-20 8 ply	6.00	Conventional	1.15
7.50-20 10 ply	5.00	Conventional	1.35
8.25-20	5.00	Conventional	1.35
9.00-20	5.00 6.00	Conventional	1.60
10.00-20	6.00 7.33	Conventional	2.20
11.00-20	7.33	Conventional	2.50
12.00-20	8.37	Conventional	2.70
13.00-20	8.37	Conventional	2.70
14.00-20	8.37 10.00	Conventional	3.65
7.50-20	6.00	Split Wheel	1.60
8.25-20	6.00	Split Wheel	1.60
9.00-20	6.00	Split Wheel	1.60
12.00-20	10.00	Split Wheel	3.00‡
14.00-20	10.00	Split Wheel	3.65‡
9.00-13	(5.50 D.C.) (6.50 Split)		1.45

* None (usually no flap is used). † Figures on crude rubber apply with or without bead lock. ‡ With bead lock the limits may be increased 10% because of additional length required.

Sizes not listed shall be in proportion to sizes shown.

In the event a manufacturer on February 15, 1942, was using less rubber in any type or size of flap than the maximum amount listed above, he shall not increase the amount of rubber which he uses in manufacturing flaps of the same type or size.

Amendment No. 2

Section 940.5 *(Supplementary Order No. M-15-b-1)* is hereby amended as follows:

1. By inserting the following new subparagraph immediately after subparagraph (b) (11) thereof:

(12) Specifications for the manufacture of insulated wire and cable. List 12.

2. By attaching thereto the attached additional list designated List 12.

This Order and specifications set forth in the list attached hereto shall become effective on April 1, 1942.

Issued this 25th day of March, 1942.

J. S. KNOWLSON
Director of Industry Operations

List 12 (Effective April 1, 1942). *Specifications for the manufacture of insulated wire and cable.*

(a) *Compounds*

Type	*Grade*	*Maximum % by Volume** *Rubber*	*Scrap Rubber*	*Trade Identification*
(1) Insulations	A	55	14	Performance type otherwise known as ASTM D-353-1941
	B	35	18	ASTM D-353-Emergency ASTM D-574
	C	13	60	Code Grade 2/11/42
(2) Jackets	D	50	35	ASTM D-532-Emergency

* For each per cent of rubber by volume reduced, reclaimed and scrap rubber may be increased 2.5 per cent by volume.

(b) *Insulated Wire and Cable*

Insulations and jackets of each of the classes of wire and cable listed below shall be made from one of the grades of compounds listed in subdivision (a) of this specification, the appropriate grade of compound to be used for insulation or jacket being that hereinbelow specified therefor opposite the description or designation of such class.

Type of Service	*Operating Voltage*	*Compounds for Insulation*	*Jacket*	*Outer Covering*
(1) Building wire and general service in dry locations	0–3000	C	none	Fibrous or Lead
	3001–5000	C	none	Lead
	3001–5000	B	none	Fibrous
	5001 and over	B	none	Fibrous or Lead
(2) For general service in wet or damp locations	3001 and over	B	none	Lead or Impervious sheath
	any	A	none	Fibrous
(3) For general service at copper temperatures above 60° C., motor leads and for severe mechanical conditions	any	A	none	Fibrous, Lead or Impervious sheath
(4) Portable heavy duty service of the following kinds only: (i) Electric power shovels and dredges; (ii) Mining locomotives and machinery; (iii) Welding machinery and power leads; (iv) Portable drills and tools; (v) Electrically driven construction machinery, including air compressors, cement mixers, conveyors, hoists, cranes, locomotives and public conveyances; (vi) Oil well exploration cable.	0–5000	B	D	
(5) Portable appliance service cords	0–600	C	none	Fibrous

Provided that compound (D) may be used as a jacket in the manufacture of three conductor type POSJ-32 cord for use in lengths not exceeding one foot between wet-proof electric heating pads and heat control switches; and provided further that compound C may be used as a jacket in the manufacture of type PWP cord.

Type of Service	*Operating Voltage*	*Compounds for Insulation*	*Jacket*	*Outer Covering*
(6) Automotive Ignition cable	any	B	none	Fibrous

(7) Compounds used for manufacturing cable tape shall contain no Rubber and not more than 80% by volume of Reclaimed and Scrap Rubber, and shall be applied only to one face.

(8) No Rubber, Latex or Reclaimed and Scrap Rubber shall be used as Insulation on the neutral wire of a grounded neutral system.

(9) Rubber jackets, belts or sheaths shall not be used in wire or cable except as provided in Section (4) above.

Amendment No. 3

Section 940.5 *(Supplementary Order No. M-15-b-1)* is hereby amended as follows:

1. By adding the following to subdivision (b) of List 7 attached thereto, and also to subdivision (b) of List 9 attached thereto:

All compounded rubber in a tire, other than the tread and sidewalls, is considered as "friction", and the tread and sidewalls are considered "tread". Each tire manufacturer should adopt minimum gauges or thicknesses in the following parts of all tires:

Sidewalls (but within the above specifications).
Plys and squeegees.
Under-tread (but within the above specifications).
Cushions and breakers.

"Minimum" as used herein means the thinnest gauge which the manufacturer believes can be used without materially detracting from the performance of the tire.

Any manufacturer who can use subtreads, or who can apply side walls separate from the tread, and who can in either of these ways save Rubber without detracting materially from the performance of the tire should do so, even if it requires the use of slightly more reclaimed rubber. The total amount of Rubber and reclaimed rubber which a manufacturer may

use if he uses subtreads or sidewalls to save Rubber is the amount calculated in accordance with the appropriate friction and tread formulas, less the amount which may be saved through the use of subtreads and/or sidewalls.

Each tire manufacturer shall as soon as practicable after entering into the production of tires under the formulas prescribed above but not later than April 30, 1942, submit to the Rubber and Rubber Products Branch a report on a form to be prescribed.

2. By changing subdivision (c) of List 7 attached thereto to read as follows:

(c) *Capping stock and camelback.*

(1) Capping stock may be manufactured only in gauges of 10/32, 12/32, 14/32, 16/32, 18/32, 20/32, 22/32 inches and larger.

(2) Camelback may be manufactured only in gauges 18/32, 20/32, 22/32 inches and larger only by special permission from the War Production Board.

(3) Capping stock and camelback in gauges of 18/32 inches and larger when required for recapping truck and bus tires and for retreading special purpose tires, shall be manufactured only from compounds of Grade C.

(4) Capping stock of gauges of 16/32 of an inch and smaller for recapping tires for trucks and busses shall be manufactured only from compounds of Grade C.

(5) Capping stock for recapping passenger car tires shall be made only from compounds of Grade F, and only in gauges of 10/32, 12/32, 14/32 and 16/32 of an inch. Such capping stock may be faced with cushion stock of any of the gauges listed below; provided that cushion stock of any such gauge shall not contain more Rubber by weight than the percentages set forth opposite such gauge.

Gauge	*Percentage of Rubber*
.012 inches	54
.013 inches	51
.014 inches	48
.015 inches	45
.016 inches	42
.017 inches	39
.018 inches	36

3. By inserting the following new subparagraphs immediately after subparagraph (b) (12) thereof:

(13) Hospital sheeting, List 13.
(14) Miscellaneous articles to fill Army Orders, List 14.

4. By attaching thereto the attached additional Lists 13 and 14.

This Order and the specifications set forth in the lists attached hereto shall take effect as of the date of the issuance of this Order.

Issued this 3rd day of April, 1942.

J. S. KNOWLSON
Director of Industry Operations

List 13—*Specifications for the manufacture of hospital sheeting.*

(1) The color shall be black or maroon only.

(2) The thickness shall be .020 inches plus or minus .002 inches.

(3) The width shall be 36 inches plus or minus one inch.

(4) The compound shall contain not more than 20 per cent Rubber by weight.

(5) The weight of the compound shall not exceed 17 ounces per square yard.

List 14—No Rubber (as defined in paragraph (a) (1) of Supplementary Order No. M-15-b as amended) shall be used in the manufacture of any of the following articles for delivery to or for the account of the United States Army, even though the use of Rubber therein may be called for by the army purchase orders or the army specifications:

Ash trays; bath trays, sponges and soap dishes; bumper stripping; buttons; cap covers; channel filler; chemically blown sponge products; cowl vent seal sponges; dish drainers; door checks and bumpers; escalator handrails; flooring (except conductive flooring); fly paper; fly swatters; foot-bath trays; friction tape; furniture upholstery and cushions; gun grips; gym and basketball shoes; handle grips; heel bases; heels; hospital sheeting and pillow and mattress covers; kneeling pads; labels.

Mallet heads; mats and matting (except conductive mats and matting); molded wheels and casters; name plates; pedal rubbers; plate wipers; raincoat fabric; recoil pads; rubber bands; rubber-covered lamp-guards, handles, grabrails and knobs; rubber-set brushes; seal sponges; serving trays; sewage disposal bags and paper; sink stoppers; sponge crash pad; telephone bases; thermostat covers; tile and tiling; toilet seats; typewriter keys; wainscoting; water hose; weatherstrip; wrestling mat covers.

Amendment No. 4

Section 940.5 *(Supplementary Order No. M-15-b-1)* is hereby amended by changing the period at the end of sub-division (8) of List 12 attached thereto to a semi-colon (;) and inserting immediately thereafter the following: "provided that the new provisions of this sub-division (8) shall not become effective until May 1, 1942."

This order shall become effective as of its date of issuance.

Issued this 11th day of April, 1942.

J. S. KNOWLSON
Director of Industry Operations

Neutralizing the Odor of Reclaimed Rubber

AN interesting comment under the above title appears in the March-April, 1942, issue of *The Givaudanian*, house organ of Givaudan-Delawanna, Inc., 330 West 42nd St., New York City, manufacturers of aromatics and deodorants for the rubber and other industries. The comment follows:

The compulsory use of reclaimed rubber for household and personal rubber goods recently ordered by the W.P.B. has forced the manufacturers of such products "to do something about the odor."

The odor of reclaim has not been objected to in tires, but, when drug sundries smell like tires, that's another story. The odor then becomes bad, objectionable, impossible — many more adjectives could be added, mostly of a less complimentary nature.

Fortunately for all concerned the rubber industry, even if it has not as a whole adopted deodorants, is aware of their existence.

Naturally, few people, if any, would expect to make a reclaim compound smell like one made from pale crepe for that is out of the question with our present aromatic materials.

The Givaudan laboratories have been working on the problem of developing suitable types of deodorants for modifying the odor of reclaimed rubber with the result that three excellent deodorants can now be recommended. These are lasting in effectiveness, economical, sufficiently non-volatile to withstand the usual cures, and they give a neutral or a rather pleasingly different odor to the compound.

The number of available aromatic materials has been reduced very considerably in the past six months in particular, thereby making it more difficult to blend suitable deodorants from currently obtainable chemicals. However, the products now offered by Givaudan have the approval of those who have tested them.

Editorials . . . . . .

Real Start of the Synthetic Program

CHARGES and countercharges have been flying thick and fast in recent weeks anent the crude and synthetic rubber situations. Most of the barbs have been aimed at Jesse Jones, Federal Loan Administrator and Secretary of Commerce, intimating that Jones alone is responsible for the drastic situation in which the country finds itself with respect to rubber supplies. In at least one instance, President Roosevelt was brought into the picture with respect to the toning down of the synthetic rubber program back in 1940 when the National Defense Advisory Committee, headed by Edward R. Stettinius, Jr., recommended provision be made for 100,000-ton-a-year capacity.

The Standard Oil Co. of New Jersey, and various subsidiaries, including Jasco, Inc., which is vested with the buna and butyl rubber patents, came in for its share of sensational charges when Assistant Attorney General Arnold accused the companies of furnishing information on butyl rubber to Germany at a time when they refused to give such information to the government or to the British. A threatened anti-trust suit against the companies by the government was withdrawn when a consent decree was signed. The details of this decree, and the charges and refutation of the charges, will be found in the following pages.

Despite the belief of certain senators, and others, that it is important for the American public to know who is to blame for the present rubber situation in the United States, and the apparent belief of Mr. Arnold that Standard Oil should be crucified for its pre-war dealings with I. G. Farbenindustrie of Germany (which in itself would make another editorial) we can't help feeling that the more important happenings of the past month were the appointment of Arthur B. Newhall as Coordinator for Rubber and the announcement by Mr. Jones that contracts had been awarded to 25 companies for the construction of synthetic rubber units, including some for raw materials. The latter action marks the real start of a 700,000-ton-a-year capacity for synthetic rubber and we believe that Mr. Newhall can see the program through.

Detroit Launches Rubber Project

HIGH praise is due the Detroit Rubber & Plastics Group, and to its officers and members, for the excellent job they have done in providing courses in the technology of rubber and plastics at Wayne University in Detroit. Not only has the group undertaken to provide the courses, with the assistance of the faculty of the university, but it has also undertaken the job of outfitting a complete laboratory at the university in connection with these courses and for special research. The project has been under way for about a year, but has now been given formal acceptance by the university and by the Detroit Board of Education of which the university is a part.

The zeal with which the group has approached the job of amassing equipment for the laboratory is especially to be commended. Several important pieces of equipment have already been secured. Much is still needed, as will be noted from the news story elsewhere in this issue. Donations of all kinds—equipment, books, materials, cash—are needed to enable the group to fulfill its program. This is the kind of request which few in the rubber industry should deny. We urge that the news report of the project be carefully read.

Our 25th Anniversary

WITH this issue RUBBER AGE begins its twenty-sixth year of publication. The first issue appeared on March 26, 1917 — during the first World War. Our Silver Anniversary, coming as it does during another World War, will not be celebrated with a special issue or by any other of the customary means publishers usually take to call attention to a milestone in their history. We're much too busy on more pressing problems of the day, so we will content ourselves with the reiteration of our promise to continue our policy of alertness and constant progress so that both RUBBER AGE and the RUBBER RED BOOK may still better serve the industry to which they are mutually dedicated.

CURRENT NEWS OF THE MONTH

NEWHALL IS NAMED COORDINATOR FOR RUBBER; SCRAP AND RECLAIM NOW UNDER RESTRICTION

THE past month has been the most hectic experienced in and by the rubber industry—not only since the outbreak of war but in its entire history. It witnessed the appointment of a Coordinator for Rubber, new rules and regulations concerning consumption of rubber, the release of specifications for additional rubber products, sensational charges concerning synthetic rubber patents, awarding of contracts for synthetic rubber units and plants to supply basic raw materials for 700,000-ton-a-year capacity, plans for the cultivation of crude rubber in South and Central American countries on a huge scale, the addition of scrap and reclaimed rubber to the regulation lists, setting of prices on certain types of rubber products, and numerous proposals for the conservation of rubber. History is in the making not only for the world but for the domestic rubber manufacturing industry. Many of the current trends will have a decided effect in post war days.

Of special interest and of extreme importance was the announcement of the appointment of Arthur B. Newhall, chief of the Rubber and Rubber Products Branch of the War Production Board, as Coordinator for Rubber, with broad powers to direct and integrate all current problems dealing with the use, control or production of natural and synthetic rubber, made on March 31 by Donald M. Nelson, chairman of the War Production Board.

Duties of the Coordinator

Subject to the direction of the chairman, Mr. Newhall as Rubber Coordinator will:

1. Exercise general supervision over the work of the Rubber and Rubber Products Branch of the Division of Industry Operations, W. P. B.;

2. Exercise general supervision over the work of the Synthetic Rubber Section of the Division of Materials, W. P. B.;

3. Determine, whenever and to the extent he deems it necessary, policies and standards to govern priorities and allocations with respect to rubber, including both allocations as between essential civilian needs and other broad classes of demand and allocations among particular civilian needs;

4. Exercise general supervision over the activities of the Bureau of Industrial Conservation of the War Production Board relating to rubber, with particular reference to salvage, conservation and substitution;

5. Coordinate and exercise general supervision over all work within the War Production Board relating to military or civilian specifications involving the use of rubber;

6. Coordinate the rationing of rubber tires and tubes by the Office of Price Administration with activities within the War Production Board relating to rubber;

7. Represent the chairman of the War Production Board in relation to the activities of the Reconstruction Finance Corporation or any subsidiary thereof, and the Office of the Petroleum Coordinator for National Defense, with respect to:

   (a) The provision of additional facilities for the production of synthetic rubber or any of the raw materials therefor;
   (b) The stockpiling of rubber;
   (c) The purchase or sale of rubber or rubber products;
   (d) The financing of additional production facilities, or of transactions in rubber or rubber products;

8. Coordinate measures for enlisting public support for the conservation and salvaging of rubber;

9. Inform himself concerning and keep in touch with the activities of all other Government departments and agencies with respect to rubber;

10. In general, represent the Chairman of the War Production Board with respect to aspects of the rubber problem.

Mr. Newhall, the first rubber executive appointed as chief of the Rubber Branch of W. P. B., is a Dollar-a-Year-Man, lent to the government by Talon, Inc. He was associated with Hood Rubber for more than twenty years and acted as executive vice-president of the parent Goodrich company in 1938 and 1939 before joining Talon as a vice-president. In assuming his new job as coordinator, Mr. Newhall summed up the rubber situation in two words: "It's desperate." He assured the industry, however, with the statement that "the synthetic rubber program will get off paper and into the operation stage from now on."

As anticipated, strict controls on the use and sale of scrap and reclaimed rubber were put into effect on March 21 by the War Production Board. The restrictions, which permit consumption of scrap and reclaim for designated products only, are contained in Amendment No. 6 to Supplementary Order No. M-15-b (see page 37). After March 31 the order banned the use of reclaimed rubber except for the following purposes:

1. To manufacture any of the products for which crude rubber or latex is permitted, provided that reclaimed rubber may not be used to fill war orders until a report has been forwarded to the W. P. B. rubber branch.

2. To manufacture a specific list of products, known as list E, the amounts so used to be determined by a specific formula.

3. For the month of April only, to manufacture another specific list of products, known as list F. After April 30, specific allotments of reclaimed rubber will be made from time to time to manufacturers of products on this list.

At the same time this restriction order was issued by the W. P. B. it was announced that appeals will be entertained by the Rubber Branch for products not listed. Appeals, however, will not be considered for a number of items. To simplify matters, W. P. B. issued a list, known as List G, of products on which appeals would not be entertained. This list is reproduced in full of page 38 of this issue.

Contains Ban on Destruction

The order also contains a general ban on the destruction of certain rubber products except where essential to manufacturing or reclaim operations. Officials pointed out that there is a substantial loss of reclaimable rubber in the destruction of worn-out tires, casings, tubes, waterproof footwear, heels, storage battery boxes, and similar products. Estimating the country's reclaiming capacity at about 350,000 short tons annually, the point was stressed that this supply of reclaim is completely dependent upon the supply of scrap.

Collections of scrap have fallen off sharply in recent months, since most persons have hesitated to give up worn tires which in former years constituted the main source of scrap. Since Pearl Harbor, it was said, receipts of scrap

at reclaiming plants have been less than one-half of the normal rate. Too many persons have the mistaken belief, as Leon Henderson pointed out recently, that casings worn or damaged beyond repair are acceptable as "basic carcasses" for retreading or recapping. In this connection it is interesting to note that the W. P. B. has enlisted the aid of W. P. A. labor and trucks to bring in scrap rubber and metal from the nation's farms.

The order restricting the use and sale of reclaimed or scrap rubber also prevents the acquiring of excessive inventories by users of these materials by banning the purchase or acceptance of delivery of a greater quantity than necessary for a minimum working inventory, taking into consideration restrictions on production contained in the order. Inventories in excess of 60 days' needs will be deemed in excess of a practical working inventory, as is the case with crude rubber or latex.

For the purpose of the order, reclaimed and scrap rubber are defined as "all rubber and products and by-products of rubber commonly known as scrap rubber, whether vulcanized or not, and whether or not contained in any mixture or compound, and all rubber reclaimed by any process." It does not include rubber or latex as defined by the order, or balata, gutta-percha, gutta siak, gutta jelutong, or pontianac.

Rubber Use Further Restricted

In a move to save more than 1,000 tons of crude rubber and latex a month, Amendment No. 7 to Supplementary Order No. M-15-b was issued by W. P. B. on March 30 (see page 38). This amendment reduces the permitted consumption of rubber and latex in more than 50 products and eliminates such use in approximately 20 products. In addition, more than 15 products are transferred from the lists which allow the use of rubber up to certain percentages of a base period to lists of products for which manufacturers must secure specific permission for the use of rubber or latex from the Rubber Branch.

The new List A — which lists products for which crude rubber may be used only up to certain percentages of the average monthly consumption for the year ended March 31, 1941 — now contains 23 groups compared with the previous list of 31. List B — products for which manufacturers must secure specific permission — has been increased from 10 to 27 groups.

Among products transferred from List A to List B (requiring application to the Rubber Branch for an allotment of crude rubber) are commercial diving equipment, elevator and conveyor belts, cable splicing compounds, and cements for repair and manufacturing shoes.

Completely eliminated from the use of crude rubber are wire braid hose, vacuum cleaner belts, hard rubber syringes, and dental dam. An increase from 80 to 100% in the consumption rate for gasoline, oil tank wagon and sanitary hose is provided.

Included among the permitted products added to the permissible lists are cement gun hose, grease gun hose, hydraulic control hose, and molded seals for dam and lock gates (100%); molded cable connectors and terminal blocks (80%); self-adhering gauze bandages and pneumatic truss pads (50%).

A new classification is set up for autopsy and mortuary gloves, and net-lined and all-rubber gloves for handling corrosive or severely abrasive materials at a 20% rate. Latex used in the production of feeding nipples, surgeons' gloves, non-automotive V-belts, and cements for the manufacture of shoes must now be allotted by the Rubber Branch.

Blood pressure bags, inhalation bags and face pieces (medical, surgical, etc.), operating cushions, sinus and cautery bulbs, and compounds for treating tire cords have been completely eliminated from the use of latex.

The manufacture of blowout shoes, regarded as an uneconomical form of tire repair, was prohibited by Amendment No. 8 to Supplementary Order No. M-15-b, issued by W.P.B. on April 11. (See page 40). This same amendment also restricts the manufacture of reliners, many of which are being used to repair tires on non-essential vehicles. A new group—tire reliners, except those cut from used or scrap tires and tubes —is added to the list of products for which reclaimed rubber and scrap rubber are permitted. Amounts of reclaimed rubber which may be consumed in the manufacture of these reliners will be authorized directly by W.P.B. after April 30.

Specifications Revised and Added

Four amendments to Supplementary Order No. M-15-b-1, which contains specifications for a number of rubber products, designed to conserve crude rubber, latex and reclaimed rubber, have been announced by W. P. B. Amendment No. 1, issued on March 25, alters the terminology of the list governing the manufacture of water-proof boots, pacs, arctics, gaiters and overshoes, but does not change the rubber content for these articles.

The list covering tire tubes, casings, etc., has been revised to provide a higher crude rubber content tread stock for certain types of truck tires, putting the tread stock for civilian and military truck tires on the same basis. The new list also provides for the manufacture of certain sizes of capping stock and camelback not previously permitted.

When this amendment was issued, the Rubber Branch explained that the total amount of rubber which may be used in a given tire may be distributed between tread and friction by individual manufacturers on a basis which they consider provides the best quality tire with the given amount of rubber. This explanation was considered important, in view of the many different opinions which exist in the tire manufacturing field. A reproduction of Amendment No. 1, which also gives specifications covering the manufacture of truck tire flaps for the first time, will be found on page 40).

Amendment No. 2 to Supplementary Order No. M-15-b-1, also issued on March 25, establishes specifications covering the manufacture of insulated wire and cable. These specifications became effective on April 1. They will be found on page 42.

The third amendment to Supplementary Order No. M-15-b-1, reproduced in full on page 42, permits the manufacture of passenger car capping stock entirely from reclaimed rubber together with a small quantity of crude for cushion stock. This provision, which will provide retreading materials for a limited number of tires to be used by workers in defense industries, formalizes an authorization for the manufacture of this type of capping stock made earlier.

This amendment also makes changes in the specifications for tires and camelback which allow manufacturers to shift the use of compounds between tread and friction within the over-all limits of crude rubber and reclaimed rubber allowed for a tire. Camelback may be made only in truck and bus sizes.

Two new specification lists were added to Supplementary Order M-15-b-1 by the amendment. One prohibits the use of rubber in the manufacture of a number of articles for the Army, even though the use of rubber may be called for by the Army purchase order or by Army specifications. This prohibition, which was issued at the request of the Army, covers such articles as ash trays, raincoat fabrics, wainscoting, weather-stripping, friction tape and furniture cushions. The other new specification list covers hospital sheeting, defining the color, thickness, width, compound and weight to be permitted.

The fourth amendment, issued on April 11, includes the announcement that specifications governing the use of rubber as insulation on neutral electrical wires becomes effective on May 1. It suspends the operation until that date of subsection 8 of List 12 of the order, which provided that rubber could not be used in this connection after April 1. This amendment is reproduced in full on page 43.

Issuance of Purchase Permits

In order to clarify the handling of purchase permits, and a few other points involved in the supply of rubber, the Rubber Reserve Co. issued Circular No. 5 on April 1. The full text of the circular follows:

1. In submitting requests to Rubber Reserve Company for the issuance of permits covering the purchase of crude rubber, manufacturers should state clearly the type and grade of rubber

desired, by R.M.A. classifications, and in addition thereto, indicate an alternate type and grade which will be acceptable in the event that the requested type and grade cannot be supplied.

2. Affidavits submitted with requests for permits authorizing the purchase of normal or concentrated latex must state the number of U. S. gallons, the dry solids pounds and the per cent of concentration.

3. In a large number of instances, manufacturers have not taken delivery of the crude rubber covered by a purchase permit during the delivery month specified in the permit, and in some instances, delivery has been delayed for several months. Effective April 1, 1942, all permits issued by Rubber Reserve Company covering the purchase of crude rubber must be presented to D. D. Haldane, Distributing Agent, 15 William Street, New York City, within 30 days from the date of the permit and delivery of the rubber covered by such permit must be taken within 30 days thereafter. All purchase permits not completed by delivery within 60 days from the date of issuance thereof will be automatically cancelled.

4. Despite instructions which have been previously forwarded from this office, some manufacturers do not submit the affidavit required under the provisions of our Circular No. 3 at the time a purchase permit is requested, thereby delaying the issuance of the permit. A separate affidavit must be submitted in connection with each request and separate requests and affidavits must be submitted for deliveries required during each calendar month.

5. As has been previously pointed out, Rubber Reserve Company cannot issue purchase permits to any manufacturer until such manufacturer has complied with the requirements of the Rubber and Rubber Products Branch of the War Production Board with respect to the execution and delivery to such office of certain forms relating to the manufacturers' activities. If this requirement has not been complied with by all manufacturers, it should receive immediate attention, otherwise the issuance of permits will be delayed.

6. All requests for purchase permits must be forwarded to the Sales Department of Rubber Reserve Company at least thirty days in advance of the date on which delivery is desired. Due to the large volume of permits now being issued daily, we cannot guarantee prompt deliveries unless the manufacturer complies with this requirement.

Prices Set, Stocks Frozen

As indicated in our previous issue, maximum manufacturers' prices for waterproof rubber footwear were established on March 11 as a result of individual agreements negotiated between the Office of Price Administration and manufacturers at recent meetings.

The agreements establish prices that are in no case higher than those in effect December 3, 1941, when Mr. Henderson requested manufacturers not to effect price increases. Prices on a substantial number of items are lower than the December 3 level. These price decreases reflect the reduction in crude rubber content ordered by the War Production Board to conserve the rubber supply.

The agreements also provide that all discount schedules that were in effect on December 3 are to be retained. O. P. A. officials pointed out that the agreements establish maximum prices only and that firms may sell at less than these levels.

These are the first agreements of this kind negotiated by Mr. Henderson under the power granted him in Section 5 of the Emergency Price Control Act of 1942. This section permits the Administrator to negotiate agreements for the stabilization of prices directly with manufacturers.

This method is reported to have been especially useful in the case of waterproof rubber footwear, as manufacturers had never before produced items exactly comparable to the new "Victory Line" of boots, arctics, and rubbers.

Manufacturers of rubber drug sundries, including essential hospital and medical items, all of which are covered in permissible lists incorporated in Amendment No. 7 to Supplementary Order No. M-15-b (reproduced elsewhere in this issue), were requested not to advance prices above those in effect on March 1, 1942, in a letter sent to them on March 16 by O. P. A. The letter requested also that all discounts, services, quality, standards, and reasonable trade practices in effect on March 1 be retained. The purpose of the request was to keep prices from mounting pending completion of an investigation to determine proper maximum prices for such sundries. A price agreement similar to that above on waterproof footwear is anticipated.

Pointing out that manufacturers of drug sundries have been allotted a supply of crude rubber and latex by the W. P. B. because of the essential nature of the products, the letter says that it is also "essential that prices at all manufacturing and distributing levels reflect only increases which are absolutely necessary for the maintenance of production."

Stocks of rubber yarns and elastic threads were frozen in the hands of manufacturers and mills by a temporary order—Conservation Order M-124—effective for 30 days beginning March 29. The order, announced by W. P. B. on March 28, prohibits the sale, delivery or purchase of rubber yarn or elastic thread, or the processing of such yarn in any way, except for filling defense orders, or as otherwise ordered by W. P. B.

The action was taken to conserve the supply of such yarn in the hands of manufacturers, knitting and weaving mills, in order that such yarns as are suitable for essential civilian needs may be allocated for that purpose. On or before May 1, it was said, an order replacing the present freezing order will be put into effect, restricting the use of suitable grades and types of elastic yarns in the hands of manufacturers and mills to Army, Navy and essential civilian requirements.

One anticipated result of the order is sharp expansion of gas mask straps and elastic surgical bindings. A number of looms capable of producing elastic web in widths from ½ to ⅞ inches are believed to have already been assigned to the production of adjustable straps for gas masks. Additional equipment will soon be assigned for such purpose, it is believed.

Miscellaneous Restriction Orders

The use of rubber covers or rubber sealing rings in containers for packaging more than 40 groups of products, including coffee, tea, tobacco, candy, spices and various sauces, was prohibited by Conservation Order M-119, issued by W.P.B. on April 9. The order does not apply to the manufacture, sale, delivery or use of rubber closures for sealing glass containers which will be shipped under provisions of the Lease-Lend Act.

Limitation Order L-71, issued by W.P.B. on March 27, prohibits the use of rubber, as well as aluminum, chromium or nickel, in the production of flashlight cases or batteries. The order was effective as of March 31.

Limitation Order L-84, issued by W.P.B. on April 6, limits the production of electric heating pads for civilian use to 50% of the amount manufactured in 1940. Hospital-type pads are limited to the 1940 volume. Manufacturers of these pads must accept no deliveries or make purchases of critical materials (including rubber) from any market except such critical materials as can be obtained from other manufacturers in the electric heating pad industry.

Beginning May 1, production of portable lamps and shades is to be curtailed to 60% of the 1940 output, according to Limitation Order L-33, issued by W.P.B. on March 24. The restrictions apply also to sockets, separate switches, plugs or lamp cords. Length of the lamp cord and its gauge is regulated by the terms of the order.

In a move designed to facilitate increased production of electric wire and cable for war purposes, O.P.A. issued Amendment No. 1 to Price Schedule No. 82, which had imposed as maximum prices on these products the prices prevailing on October 15, 1941. The new amendment exempts prices of products sold under developmental contracts with the government, simplifies manufacturers' reporting requirements, and improves control over prices of new and specially designed products. It became effective on March 17.

Substitute Products Developed

The hunt for substitutes for rubber products banned under the various decrees of W. P. B. continues. As previously stated, the use of rubber in Army raincoats has been prohibited. On March 13 the War Department announced that as a substitute all raincoat cloth will be coated with synthetic resins. According to purchasing officers of the Quartermaster Corps, a recent large procurement of the new type garments will save approximately 1,000,000 pounds of rubber. The Army's new specifications for raincoat cloth call for a coating material somewhat similar to those used on a large scale in recent months for making shower curtains and women's raincoats.

A non-elastic waistband for the underwear trade, designed to replace the elastic types used before rubber was banned for this purpose, has been developed by the Friedberger-Aaron Mfg. Co., Philadelphia. It is of resilient construction and has knitted-in buttonholes. One end of the band has a small hook so made that it lies flat against the band fabric. The new waistband can be slipped into a buttonhole slot at various points to give proper size or fit.

A device for the manufacture of elastic-top half hose and anklets without the use of rubber has been developed by a Southern hosiery mill. Called "Victory-Top," its use makes possible the manufacture of top hose which will stay up satisfactorily on the wearer's leg, according to the manufacturer, who adds that it can be made on existing hosiery machinery.

Surety Rubber Co., Carrollton, Ohio, one of the larger manufacturers of rubber and latex gloves in normal times, has introduced a glove line made from what is described as "a new synthetic plastic material that has sufficient elasticity to give ample flexibility and comfortable finger freedom." The material is said to be inert, non-toxic, odorless and tasteless and to give good resistance to abrasion and tearing. The new line is available under the trade name of "Sureseal."

A new method for re-processing used golf balls, developed to meet the wartime emergency, was announced during the month by the U. S. Rubber Co. The old covers will be removed and a new one of tjipetir, a form of balata, will be molded on. The re-processed ball will then be finished, painted and marked with its proper brand name depending on construction. The word "re-processed" will appear on the new cover. In Chicago, the May Co., a department store, was offering 50c a dozen for used golf balls. According to the buyer of sporting goods, the cover and ¼-inch of rubber will be taken off the used balls, which will then be rewound with 25% new rubber and re-covered.

As a result of the latest restrictions on the use of all forms of rubber, several rubber companies are curtailing production sharply, while others have closed their factories for the duration or, at least, until such time as certain products may again be made. In the latter category is the Mohican Rubber Co., manufacturers of toy balloons, which has closed its Ashland, Ohio, plant completely. The Eagle Pencil Co., of New York City, stopped taking orders on rubber-tipped pencils selling for less than 5c, pending a study of goods in process and the volume of unfilled orders.

Butyl and Buna Patents Freed in Consent Decree Signed by Standard Oil

Activity on the synthetic rubber front was no less hectic. The month featured the signing of a consent decree between the government and Standard Oil under which certain synthetic rubber patents were made available to industry without benefit of royalty payments, hurling of sensational charges against Standard Oil by Assistant Attorney General Thurman Arnold, the awarding of contracts to 25 companies for the production of synthetic rubber and its basic raw materials, the proposal that the government establish its own authority to manufacture and sell synthetic rubber, and a plan to provide 300,000 tons of synthetic for civilian purposes. While the charge against Standard Oil and the refutation offered by that company made the headlines during the month, the awarding of 25 construction contracts, which puts the synthetic rubber program under full sail, was of far more importance to the industry and to the fighting forces.

The consent decree, announced by the Department of Justice on March 25, was the result of a long complaint filed against Standard Oil Co. of New Jersey, six subsidiaries and I. G. Farbenindustrie of Germany, in which it was broadly charged that the American defendants conspired with Farbenindustrie to restrain trade and commerce in the chemical and oil industries throughout the world. The decree provides in part for free public licensing for the duration of the present emergency of all existing patents owned by Standard Oil and all Farbenindustrie patents over which Standard Oil has control required for the production of gasoline and rubber. After the emergency Standard Oil will be permitted to charge reasonable royalties on its chemical products.

The criminal complaint named as defendants, in addition to Standard Oil of N. J., the following subsidiaries: Standard Oil Co. of N. J. (Delaware Corporation), Standard Oil Co. of Louisiana, Standard Oil Development Co., Standard Catalytic Co., Jasco, Inc., and the Hydro Engineering & Chemical Co. Also designated as defendants in the criminal action were W. C. Teagle, chairman of the board of Standard Oil (N. J.); W. S. Farish, president and director of that company; and Frank A. Howard, vice-president of the company and president of Standard Oil Development Co. P. L. Young and William E. Curries, patent attorney and vice-president, respectively, of Standard Oil Development, were named as defendants in the civil phase of the proceedings, as were two assistant controllers of Standard Oil (N. J.).

Before the decree was entered, Standard Oil (N. J.), the six subsidiaries, and Messrs. Teague, Farish and Howard were fined $5,000 each after they had pleaded *nolo contendere* to charges of violating the anti-trust laws. In this connection, a company statement indicated that its war work was more important than court vindication and therefore it had agreed to the consent decree. It denied, however, that its contracts with I. G. Farbenindustrie, and certain subordinate agreements and practices which have grown up under them, tended to restrain trade in violation of the anti-trust laws. Farbenindustrie was named in the action as a co-conspirator, not as a defendant.

Specific Charges Made

Following are the more important charges raised in the 66-page complaint against Standard Oil and its subsidiaries insofar as synthetic rubber is concerned:

That while Standard had given I. G. all necessary information concerning its butyl rubber patent (as provided in the terms of the contract between the two companies), I. G. had declined to give data about its buna patents for reasons of military expediency.

That when Jasco, Inc., was formed as a Louisiana corporation both Standard and I. G. agreed that all synthetic rubber processes would be brought into mutual use, but although I. G. developed and used Buna S and Buna N extensively in Germany in 1934 it refused to transfer the patents and processes to Jasco.

That although many American rubber manufacturers and chemical companies asked I. G. or Standard for buna licenses since 1932 both companies "encouraged" the companies to believe licenses would soon be received but actually wished to discourage the others from independent research, at the same time desiring to know what progress was being made by the applicants in the research field.

That despite the fact that I. G. was in default under the terms of its agreement by failure to acquaint Standard with the buna technique and refused to sanction any general program for the exploitation of synthetic rubber, Standard decided it would do nothing regarding such exploitation until permission from I. G. was obtained.

That before 1932 DuPont had developed a synthetic rubber known as

DuPrene (now called neoprene) and later I. G.., DuPont and Standard agreed that no Buna N would be sold in the United States in competition with that product.

That after the outbreak of the present war Standard and I. G. made an agreement to avoid having the Jasco patents, including the buna patents, from being seized by countries with which Germany was at war.

That about November, 1939, Standard told tire and other rubber companies that it had acquired control of the buna patents and that Standard and I. G. had developed a plan about that time to make sure they would have complete domination in the production and sale of synthetic rubbers.

That this plan involved formation of a corporation in which Standard would hold 51% of the stock with the rest owned by leading tire manufacturers and that the tire concerns had to accept licenses at royalty rates of 7½c per pound and cross back all improvements in the manufacture of the product. (This rate was later cut but the other agreement remained. Up to January 1, 1941, only Firestone and U. S. Rubber had availed themselves of licenses).

That although Standard had transferred samples of butyl rubber and complete technical information regarding it to I. G. in March, 1938, and at other times thereafter, Standard did not make any samples of this rubber available to any tire company for testing purposes for tires and tubes until June, 1940, at which time it sent samples to Firestone and U. S. Rubber.

Additional Charges Made

That Standard's scheme to achieve a monopoly in synthetic rubber was interrupted by the request of the U. S. Government that it enter into a pool with other rubber companies to license the buna patents in connection with the defense program. (In December, 1941, Standard, Firestone, Goodrich, Goodyear and U. S. Rubber entered into a contract with the Rubber Reserve Co., under the terms of which all agreed to pool their patents of the buna type and issue licenses to any person at the request of the Rubber Reserve Co.).

That Standard's butyl patents were not included in the government pool and that to date Standard has not issued any license under such patents. (EDITOR'S NOTE: The neoprene patents controlled by DuPont were also not included in the government pool).

One result of the consent decree making available the buna and butyl rubber patents to industry royalty-free will be the saving to the government of between $6,000,000 and $7,000,000 annually, according to officials of the Department of Justice. Standard Oil will lose this amount in royalties which will accrue to the government since the latter will be virtually the sole consumer of synthetic rubber for the duration.

Arnold Broadens Charges

The charges contained in the complaint filed against Standard Oil by the Department of Justice, which culminated in the consent decree on March 25, were broadened in testimony given before the Truman Committee of the Senate, investigating the entire rubber situation, by Thurman Arnold, Assistant Attorney General, in charge of the anti-trust division, the following day, March 26.

Declaring that he did not believe Standard has entered into its agreements with Germany to aid the Hitler government and that there was no essential difference between what Standard had done and what other companies, operating in cartels, have done, Mr. Arnold charged that Standard's failure to make available its developments in synthetic rubber had been the principal cause of the present shortage. "Standard Oil wanted a world monopoly in oil and synthetic gasoline," he said, "while I. G. was interested in chemicals. Each gave the other a world monopoly insofar as they were able to convey it, with the exception of Germany, which reserved its own market in synthetic gasoline, while Standard gave Germany control of synthetic rubber in the United States."

Mr. Arnold further charged that Standard as late as after December 7, 1941, refused to make its developments with respect to butyl rubber known to the Navy which had requested this information, although some details had been released to some specialty companies in the United States. He introduced a letter written by one of the Standard officials which intimated that although T. A. Werkenthin, materials engineer of the Navy Department, stationed in Washington, was conducted through the "K" plant, he left with no definite picture of the operations.

Standard Oil, said Mr. Arnold, had two difficulties. First, it was afraid that American rubber companies might develop their own synthetic rubber business and free themselves from Standard's domination, and second, I. G. Farbenindustrie would not permit it to take any positive action. As early as 1935, he said, Standard realized that I. G. was not releasing full information concerning buna.

"Not only was the production of synthetic rubber in this country absolutely stifled by Standard's adherence to restrictions imposed upon it by I. G. Farbenindustrie, which they always loyally preserved," Mr. Arnold stated, "but after 1939 when Standard received permission to enter into negotiations with rubber companies, Standard proceeded further to retard the development of synthetic rubber because of its natural monopolistic desire to keep complete domination over the industry."

In his testimony, the assistant attorney general made reference to the development of butyl rubber by Standard and its subsidiaries which, he said, costs 7 to 15c a pound compared with 20c for crude rubber and which was "better and cheaper" than any Germany had. Germany, he claimed, is now meeting the demands of its armies with synthetic rubber and the production of buna equals her former imports of natural rubber.

Standard Denies Charges

Mr. Arnold's charge that Standard Oil had hindered and delayed the production of synthetic rubber in the United States was declared to be "wholly without foundation" by W. S. Farish, president of the New Jersey company, in a formal statement issued on March 27. He said that such charges were made in the threatened anti-trust suit, settled by the consent decree on March 25, but that the company declined to consider any settlement unless this charge was withdrawn. The Department of Justice withdrew the charge.

Indicating in the statement that he had been asked to appear before the Truman Committee, he said that he was withholding certain details for his appearance before that committee, but was issuing the formal statement because he felt that there should be no delay in answering the additional charge that Standard gave to the Germans but not to the U. S. and British governments information on how to manufacture butyl rubber. The facts on butyl rubber, as outlined by Mr. Farish in his statement, follow:

"Butyl rubber was the outgrowth of research conducted, first cooperatively and then separately, by the German I. G. company and Standard in an effort to find a way to vulcanize a rubberlike product called Vistanex which had originated with the I. G. Standard discovered that by adding a minute percentage of another ingredient and changing the process there could be produced a true rubber, capable of being vulcanized.

"The raw materials for this product, which we call butyl rubber, were cheap, but it was difficult to make and its quality was bad. In 1938, soon after Standard had discovered this product, it reported it to the I. G. in the normal way, pursuant to the research arrangement between the parties in the field of synthetic rubber produced from oil.

"The allegation that the I. G. was at that time withholding technical information from Standard on German synthetic rubber, and therefore Standard should not have lived up to its commitments, is untrue. I. G. was at the same time supplying Standard with much-desired information on the production of raw materials for buna rubber from oil. The only thing I. G. was withholding was the detail of their government-sponsored program of producing Buna rubber from coal in Germany.

"While the butyl rubber was recognized from the beginning to have commercial possibilities, it was obviously of no value to Germany's self-sufficiency program, because the main raw material for its manufacture, isobutylene, which comes from oil refining, is not available

in Germany in the necessary large quantities. If it were available the first use for it would be to make 100 octane gasoline, which the Germans were never able to make on a large scale, for lack of the same type of raw materials. The same situation applies to Italy.

"For the reasons stated, the disclosure of the butyl rubber at its early stage of development to the I. G. in 1938 was entirely consistent with the relationship of the parties and could not possibly have had any political or military implications of any kind. All exchange of information was discontinued in January, 1940.

"As to the allegation that Standard refused to disclose the product to the American Government, the facts are that in January, 1939, when only a few persons even considered the desirability of looking at the rubber problem in America from a military standpoint, Standard recognized the potentialities of butyl rubber in this connection and brought it to the attention of the Army and Navy Munitions Board. We supplied samples produced in our laboratory to the government and to several private companies at its suggestion. The report on these samples by these companies was to the effect that the product had promise but it was still of doubtful quality.

"As to the allegation that butyl rubber is 'cheaper and better' than any other rubber, the fact is that while unquestionably cheaper than other synthetic rubbers, butyl is rated at the present time as inferior to buna rubber.

"At its present stage of development it is not suitable for hard service, which means it is not suitable for most defense purposes, although the company has hopes that it will fill an increasingly large role in the present emergency in supplying passenger cars with tires."

Truman Committee Hears Farish

In subsequent testimony before the Truman Committee, Mr. Farish, and other Standard officials, substantially repeated the information furnished in the foregoing formal statement. Additional clarification of some of the charges was, however, also made.

Appearing on March 31, Mr. Farish testified that Standard had tried as early as January, 1939, to interest government agencies in its synthetic rubber. He said that the company sought out the Army and Navy munitions board and gave it full information covering the company's synthetic rubber activities, including full data on its own butyl rubber as well as information concerning the status of buna.

In this connection, Senator O'Mahoney, a member of the committee hearing the testimony, referred back to Mr. Arnold's testimony regarding the visit of T. A. Werkenthin to Standard's plant. Senator O'Mahoney intimated that Standard had actually refused to disclose information on the manufacture of butyl to the Navy at that time. Mr. Farish replied to this assertion by stating that the Navy was merely interested in properties of the rubber in order to determine possible Navy uses.

Affirming that Mr. Werkenthin had visited the plant at the suggestion of Standard Oil, Mr. Farish also stated that the company was under no obligation to impart knowledge of its manufacturing processes to a representative of the government, although it was then trying to get the government interested in synthetic rubber. The World War had not started at the time, he added.

He further testified that it was not until March, 1941, that engineers were ready to say they could design a commercial unit to make butyl and that since that time Standard has placed under construction 7,300 tons annual butyl rubber capacity. Differing sharply from Mr. Arnold's version of buna development in this country, he said the head of I. G. Farbenindustrie came to the United States at Standard's insistence in 1938 and arranged with five leading rubber companies for an experimental program to manufacture tires.

In September, 1941, he charged, the Rubber Reserve Co. instructed Standard to suspend all work on the government butadiene project in Baton Rouge for one year but that Standard continued the work at its own expense. When Pearl Harbor changed the attitude of the country toward synthetic rubber and the R.F.C. wired Standard to go ahead with the project, the engineering work had been advanced three months.

No Apologies to Make

"Standard has no apologies to make for the part it has played and is now playing in the development of synthetic rubber," Mr. Farish said. "It brought to this country from Germany the I. G. buna rubber invention now being used in the government rubber program. Should this program be supplemented by butyl rubber, it will be because Standard, through its experience gained in working with Vistanex, another I. G. invention, succeeded in developing the butyl formula."

At one point in his testimony Mr. Farish told the committee that according to recent information Standard had received from U. S. Rubber, tires made from butyl rubber are only one-half as good as those made from natural rubber, provided they are not run over 35 or 40 miles an hour. Tires made from buna are said to more closely approach the longevity of natural rubber tires.

At another, he said creation of the necessary synthetic rubber in the United States would require less than one day's production of steel and a plant investment of approximately $15.00 per car. He urged that a synthetic program large enough to meet essential civilian as well as military needs be launched.

In testimony given by Frank A. Howard, Standard vice-president, the cost of natural rubber at 21c a pound was described as being "scandalously high." The actual cost of producing such rubber, he said, was only 5c a pound from cultivated trees and 2 or 3c a pound from wild trees. He indicated that because of the low production cost of natural rubber there had been timidity about the large-scale establishment of synthetic rubber plants.

At this point Hugh Fulton, committee counsel, introduced estimates made by Standard on June 4, 1940, placing the cost of producing butyl at 6.6c a pound and Buna S at 14.4c a pound. Mr. Howard said that to these figures there had to be added 4c capital investment cost per pound. The opinion was given that establishment of a large synthetic rubber program in this country would be looked upon with disfavor by the British and Dutch.

Jones Announces New Contracts

The real start of the big synthetic rubber program envisaged by the government came on April 1 when Jesse Jones announced that the Rubber Reserve Co. and the Defense Plants Corp. had entered into contracts and agreements with 25 leading oil, chemical and rubber manufacturing companies designed to bring the annual production of synthetic rubber to more than 700,000 tons. The plants should come into operation over the next 18 months, according to Mr. Jones, and if no unforeseen construction delays are encountered all of them should be in production by the end of 1943.

The following rubber manufacturers received new contracts: Firestone, Goodrich, Goodyear and U. S. Rubber. The other 21 companies included the following: Atlantic Refining Co., Carbide & Carbon Chemicals Co., Celanese Corp. of America, Cities Service Oil Co., Dow Chemical Co., DuPont, Gulf Oil Co., Humble Oil Refining Co., Hycar Chemical Co., Koppers Co., Monsanto Chemical Co., Phillips Petroleum Co., Pure Oil Co., Richfield Oil Corp., Shell Union Oil Corp., Sinclair Refining Co., Socony-Vacuum Oil Co.; Standard Oil Cos. of Indiana, New Jersey and Louisiana, and the Texas Co.

In addition to the above companies, Mr. Jones said there will probably be two or three groups of smaller rubber manufacturers that will be given contracts and supplied with raw materials from some of the above companies with which to manufacture synthetic rubber. The plants to be built by the rubber companies require less time to construct than facilities for the production of raw materials.

Although the announcement did not specify which companies were to make butadiene or styrene or other basic materials or the synthetic rubber itself, it has since been learned that the Gulf Oil Co. and four other oil companies have formed the Neches Butane Products Co. for the purpose of constructing a "sizable" plant for the production of butadiene somewhere in Texas. The Shell Chemical Co. has announced that it will build a large plant for the manufacture of the same material near San Francisco.

Proposals providing for the construction and operation of plants for the manufacture of synthetic rubber to a total capacity of 400,000 tons annually and the creation of a United States Rubber Authority to have charge of production and sales, were introduced simultaneously in the Senate and House by Senator Murray and Representative Better on April 9. Under the plan, the Rubber Authority would be capitalized at $100,000,000 and the plants would be placed close to sources of raw materials where they would be least vulnerable to enemy attack.

The proposed measures would authorize the Federal Works Administration to do the following things:

(1) Acquire by purchase, donation, exchange, lease or condemnation any lands or interest in lands necessary to carry out the synthetic rubber program.

(2) Provide, by contract or otherwise, for the making of surveys, plans, and the like for buildings and facilities for the making of rubber.

(3) Acquire, also by contract or otherwise, machinery for synthetic rubber making and for its installation.

The Rubber Authority to be created under the terms of the proposals would consist of three directors appointed by the president, subject to confirmation by the Senate. It would be charged with the development of new ways for producing synthetic rubber.

Stressing the importance of rubber in an all-out war program, Senator Murray, in introducing the bill, said: "The outrageous trafficking with the enemy by giant oil companies who have throttled our artificial industry through a patent monopoly has finally convinced me that we can no longer rely upon private industry to furnish us with the rubber we need to assure our national existence. Research in rubber ought to be pooled and made available to every one." Secretary Ickes approved the proposed action, if feasible.

Urges Civilian Supplies

Just prior to the introduction of legislation for a Rubber Authority for Federal supervision of synthetic rubber, production of a minimum of 300,000 tons of synthetic rubber a year for civilian use over and above the 700,000 tons already planned by government agencies was proposed by the Petroleum Industry War Council. William R. Boyd, Jr., council chairman and president of the American Petroleum Institute, who publicized the proposal on April 8, said it was prompted by the fact that the present program made no provision for civilian needs.

The council resolved that: "The appropriate Federal agencies be urged to take immediate steps to provide the money and allocate the construction materials necessary to provide for the annual production of a minimum of 300,000 additional tons of synthetic rubber for civilian use."

The council named a special committee, at the suggestion of W. S. Farish, president of Standard Oil (N. J.), headed by W. S. S. Rodgers, president of the Texas Co. The committee will investigate production of synthetic rubber, principally butyl rubber, for civilian purposes. It was empowered to act without reporting back to the council.

Plan Agricultural Investigation

A Senate Agricultural Subcommittee is mapping plans for an inquiry into the manufacture of synthetic rubber from ethyl alcohol. The decision to launch such an investigation came after the subcommittee heard testimony on March 21 that W.P.B. officials had frowned on a project to set up five grain-alcohol distilleries in Nebraska.

Dr. L. M. Christensen, Nebraska State University chemist, in testifying before the subcommittee, declared that the country's normal needs of 600,000 tons of rubber could be extracted from as little as 5% of the farm crops. European scientists, he said, particularly in Russia, Germany and Poland, had demonstrated that industrial alcohol can be converted into butadiene which can in turn be converted into synthetic rubber.

The government will have to get into the business of utilizing farm products for the production of alcohol and rubber if industry does not do it first, Senator Wheeler, of Montana, stated on March 27.

Jesse Jones Under Fire

Jesse Jones, in his capacity as head of the Reconstruction Finance Corporation, has long been under silent fire for the existing shortage of synthetic rubber production facilities. The charges came out in the open on March 24 when William L. Batt, head of the Materials Division of W.P.B., testified before the Senate's Truman Committee that Mr. Jones had overruled recommendations in 1940 for building up the country's synthetic rubber production to 100,000 tons annually, because he did not believe it was necessary. This program would have cost approximately $100,000,000. The recommendations were made by a committee of the National Defense Advisory Commission, headed by Mr. Batt.

In testimony before the same committee on April 7, Mr. Jones defended his actions in 1940 on the grounds that the government had been dealing in an experimental field and had been forced to solve many basic and involved problems in arranging for synthetic rubber production. Or, as he phrased it more succintly, the National Defense Advisory Commission, which was headed by Edward R. Stettinius, Jr., "left a baby on our doorstep which hadn't been cleaned or washed."

Mr. Jones insisted that both President Roosevelt and he had "carried out in principle" the program for 100,000 tons of synthetic rubber proposed by Mr. Stettinius as a result of the investigations conducted by Mr. Batt. He insisted that the $25,000,000 approved at that time by the President "was a figure just like the 100,000 tons." He also said that we still don't know whether we have the right answer but "we do think we can produce rubber in large quantities."

The R.F.C. head also revealed that the International Rubber Regulation Committee, apparently acting with government approval, held up deliveries of natural rubber to the U. S. before Japan entered the war "because they didn't want a stockpile" which might destroy the market price. In 1940, he said, we expected deliveries of 150,000 tons for

Thacher Directing Conservation

S. P. Thacher has resigned his position as manager of the tire engineering and service department of the U. S. Rubber Co. at Detroit to join the Motor Transport Division of the Army Quartermaster Corps at Washington as special assistant to Brig. Gen. J. L. Frink, chief of that division. He will be in charge of the rubber conservation program launched in the division, which uses approximately 50% of all the rubber going into military requirements.

One of the important phases of the Motor Transport Division's rubber conservation program, under Mr. Thacher, will be the application of the basic principles of tire servicing and maintenance that have been successfully carried out by commercial truck fleet operators by which they have been able to double or treble tire mileage. In addition, rubber will be eliminated in every place where it is not necessary, according to Mr. Thacher, who, it should be noted, has taken an active part in training soldiers "to get every mile of rubber out of a tire that was built into it."

Mr. Thacher attended M.I.T. and began his service with U. S. Rubber in 1915 as an experimental engineer. He was appointed technical assistant to the president in 1919, manager of the technical service department in 1925, general manager of tire production in 1929, technical manager of tire development in 1932, and became manager of the tire engineering department in 1935.

the stockpile and only got 40,000. South America, he stated, imported more rubber last year that it exported.

In answer to the question as to what type of synthetic rubber was being made by the various companies with which the Rubber Reserve Co. had entered contracts (other than those announced on April 1), Mr. Jones stated that the contracts with the various rubber manufacturing companies provided for the manufacture of the Buna S type rubber, that with the Standard Oil Co. of Louisiana covers butyl rubber, and that with DuPont covers neprene.

Continuing this line of thought he said butyl rubber is not as satisfactory as Buna S for tire production, but is adequate for tubes, barrage balloons, insulation, and miscellaneous mechanical goods, while neoprene, although satisfactory for tire use, has too high a production cost to enable it to compete with other synthetic rubbers for this purpose. The manufacture of Buna S, he said, will be conducted entirely under the patent pooling arrangement whereby the four participating rubber manufacturers and the Standard Oil Development Co. have cross-licensed each other with respect to any patents they own or control pertaining to the manufacture of Buna S.

In discussing the contracts placed with Goodyear, Firestone, U. S. Rubber and Hycar for the manufacture of synthetic rubber in government-owned plants, Mr. Jones revealed that these plants will have a capacity of more than 60,000 tons. In addition, he said, DuPont is completing a neoprene plant at Louisville, with a capacity of 10,000 tons, which they built upon an agreement with the R.F.C. to buy if the synthetic rubber program was enlarged. The R.F.C. is now buying that plant.

In an earlier report on the operations of the R.F.C., made to the President and Congress on March 22, Mr. Jones stated that rubber was the largest single item on the corporation's commodity program, with 673,000 tons of crude actually received or in transit for the stockpile, purchased at an approximate cost of $292,000,000. In the same report, Jones estimated that total available capacity for synthetic rubber should reach 90,000 tons in 1942 and 250,000 tons by June, 1943, with the entire 700,000 tons program completed by the end of 1943, provided that construction materials are made available in sufficient quantity.

Other Synthetic Developments

Other developments concerning synthetic rubber in the past month included the following:

As an indirect result of Thurman Arnold's charges against Standard Oil hearings have been launched in the Senate as a preliminary to consideration of bills designed to empower the president to require the licensing of patents believed essential to the war effort and, if deemed necessary, to seize such patents for government use.

That England looks to America for needed rubber supplies was evident in the statement by the British Minister of Supply on April 1 in which he announced drastic rationing of tires in England. He said, "There will be a gap to be bridged between the exhaustion of stocks and the big flow of synthetic rubber that we were hoping to get, mostly from the United States. We will be able to tide over the intervening period with extreme difficulty." England has no synthetic rubber manufacturing facilities.

Dunlop has announced plans for the establishment of a synthetic rubber plant in France, according to word from Vichy. The Dunlop factory in that country has been using buna supplied by Germany, which, it is understood, will help in supplying necessary production equipment for the new plant.

A synthetic rubber thread, believed to be the first developed, has been announced by Goodrich. The thread, restricted as to use, will be sold to textile manufacturers for military purposes in either the bare or covered form. Tests indicate the new thread has a 700% elongation.

Homer Pilkington, of Salisbury, Md., claims to have invented a new type of synthetic rubber, made with a plant base treated with chemicals. Samples have been sent to the National Inventors Council.

Louis M. Klein, an attorney of 450 Seventh Ave., New York City, also claims to have invented a synthetic rubber-like material from waste products. Little is known of the process other than that it consists of the liquid extracted from waste materials to which certain chemicals are added.

Latin-American Countries Step Up Efforts to Tap Wild Rubber Resources

News concerning the cultivation of crude rubber came from many sources this past month. Of special interest was the announcement by Jesse Jones on March 28 of the creation of a special advisory committee to work with the Rubber Reserve Co. to stimulate production of natural rubber in South and Central America and in Africa.

Members of the new advisory committee are: Paul Litchfield (Goodyear), Harvey Firestone (Firestone), John Collyer (Goodrich), F. B. Davis (U. S. Rubber), and A. Johnston (Ford Motor). Mr. Litchfield will act as chairman. The committee met in Washington recently for a preliminary discussion of the problem.

Leon Henderson, head of the O.P.A. and of the Division of Civilian Supply of W.P.B., took a flying trip to South America during the month, combining business and pleasure. He talked with officials of various Latin American countries concerning the possibility of early supplies of crude rubber from wild trees as well as discussing the long-range plantation picture.

Shortly after Mr. Henderson's visit to Brazil, President Getulio Vargas signed a decree giving the Bank of Brazil control of the entire rubber trade of that country. The action makes the bank the sole buyer and seller of rubber in Brazil. The bank is authorized to finance the manufacture of Brazilian rubber products as well, many of which will be shipped to the United States. It was intimated that the bank may commandeer hoarded stocks at current market prices, believed to be around 39c a pound.

President Elie Lescot of Haiti, who visited the United States last month, issued a formal statement in which he revealed that the developments in rubber production in Haiti made possible by a $5,000,000 Export-Import Bank loan included the planting of 2,000,000 new trees and the transplanting of 500,000 young trees. Thomas Fennell, president of the Haitian-American Agricultural Development Co., in charge of the program, said on March 25 that Haiti may be able to produce 5,000 tons of crude rubber this year if necessary. If the need were sufficiently acute, he stated, year-old trees could be cut off and ground up for their rubber.

Ecuador Organizes Effort

Ecuador may become an important supplier of crude rubber in the near future. That country possesses vast numbers of rubber trees of all ages and with high yield, according to Dr. Roberto Levi of that country, a visitor to the United States last month on a special economic mission. No organized effort has been taken in recent years to tap these trees, he said, but such efforts are now under way and should prove fruitful.

Honduras is joining other Latin American countries in tapping wild rubber trees to help compensate for the loss of rubber from the Far East. Minister of Agriculture Salvador Aguirre addressed an appeal on April 5 to the provincial governors of Honduras calling attention to the fact that the United States is buying rubber at high prices and requesting a survey of rubber resources. Wild rubber grows in considerable quantity in the Departments of Olancho, Comayagua and Atlantida.

Indians, once expert at collecting rubber, are again engaging in that work in the Darien jungles of Panama. Wild rubber grows prolifically in the Provinces of Cocle and Veraquas. Such rubber will be bought by the Panama Government Farm Bank at prices quoted in New York. The government hopes to exchange the crude rubber it secures for finished tires made in the United States.

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instituted in Argentina for conservation purposes. In the meantime, the government is negotiating with Brazil for crude rubber supplies on a basis approximating the imports from that country last year. In 1941 Argentina imported 3,200 tons of rubber from Brazil as compared with only 887 tons in the previous year.

Guatemala has established a government monopoly on the purchase and sale of crude rubber by presidential decree. Australia is planning the extensive cultivation of crude rubber on a commercial basis. Ceylon has issued a warning to rubber producers who have been holding up their stocks of rubber for various reasons. Stocks may be commandeered.

Urges Kok-Sagyz Development

Appearing before the Agricultural Committee of the House of Representatives on March 12, Dr. Paul Kolachov, director of research of Joseph E. Seagram & Sons, Louisville, Ky., again urged that funds be made available for the development of *Kok-Sagyz* rubber in the United States. He said that "if from 150 to 200 pounds of crude rubber per acre are obtained in Russia from *Kok-Sagyz*, we are positive that these yields could be increased on American soil by American farmers with improved machinery." He also said that *Kok-Sagyz* rubber would cost about 31c a pound, which, in his belief, was about one-half the cost of synthetic rubber.

Claims that *Kok-Sagyz* contains 12 to 27% of rubber latex and that it will yield from 150 to 200 pounds of rubber per acre are considered dubious by officials of the Department of Agriculture. Translations from scientific articles in Russian publications are said to indicate that average yields of only 30 pounds an acre can be expected while percentages on a dry weight basis are considerable below the 12 to 27% claimed. Moreover, only experiment can prove what the plant will do on American soil.

Furthermore, these officials say, the statement that the plant yields rubber in the form of latex is not quite accurate. *Kok-Sagyz*, like guayule and goldenrod, contains rubber in the form of minute solid particles embedded in the plant cells. Therefore, the plant must be harvested whole and ground in pebble mills and the rubber separated out by chemical processes, thus adding to the cost.

In any event, the State Department has sent a request to the Russian Government for a quantity of *Kok-Sagyz* seeds. It was asked that these seeds be supplied "as speedily as possible." Previous attempts to secure such seeds brought no results. It is believed, however, that with world affairs as they are the current request will get action and experimental plantings in this country will be made in the near future.

According to Dr. Kolachov, a yield of 600,000 tons of rubber can be secured from *Kok-Sagyz* if an estimated 7,000,000 acres of land, which is available in 42 states, could be used for planting. The plant will grow in areas which have at least 20 inches of rainfall annually. *Kok-Sagyz* is a one-year crop.

Report Progress on Guayule

Rapid progress in the guayule project is reported by the Forest Service of the Department of Agriculture. Seed sowing for 500 acres of nursery beds near Salinas, Calif., started the last week in March, and plowing and discing of the beds have already been completed. Soil surveys and maps have also been completed. Sowing will follow progressively behind installation of irrigation systems in the nursery.

Digging and field planting the 10,500,000 seedlings acquired from the Intercontinental Rubber Co. started the day the guayule bill received presidential approval (March 5). Planting will proceed at an increased pace as weather permits, utilizing six planting machines that have been obtained and repaired. About 875 acres of field planting were completed in the first week of the current month.

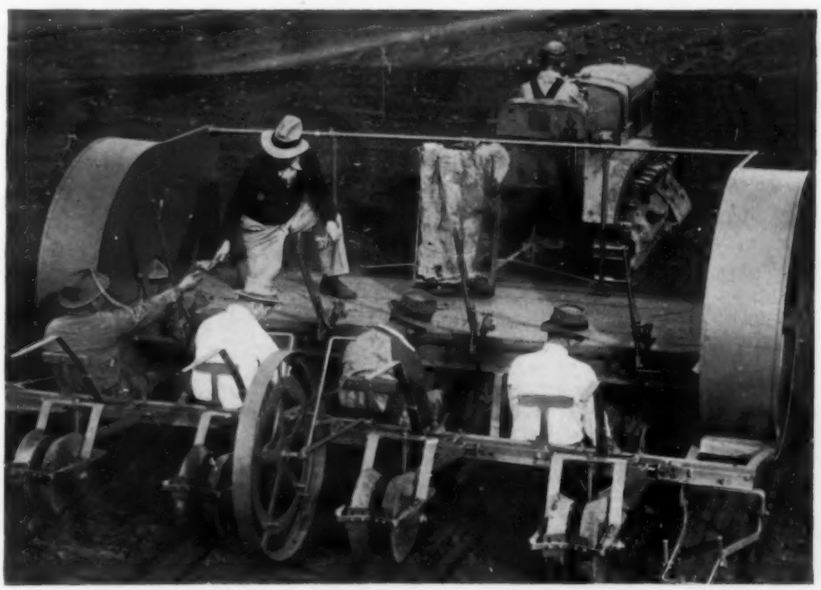
Some 500 workers are on the job in California, including Forest Service personnel detailed from several regions. Investigations by the Bureau of Plant Industry looking to the establishment of test plots for guayule production are under way in other areas, including Mexico. The Colorado State College Experiment Station, it is understood, is testing the shrub to determine the possibilities of growing it in Colorado. The Bureau of Agricultural Chemistry and Engineering is checking on guayule rubber manufacturing facilities.

On March 27 the House Appropriations Committee approved the sum of $4,200,000 for the guayule development program. This amount was to cover initial expenses in the $25,000,000 project and included approximately $2,000,000 for the acquisition of certain of the assets of Intercontinental Rubber.

Cornell Investigating Plants

More than a score of botanists and horticulturists have been set to work by Cornell University, Ithaca, N. Y., to ferret out new sources of natural rubber, it was announced on March 31. These scientists will undertake an intensive survey of approximately 1,000 plants known to contain some degree of rubber as the opening phase of the research, said to be sponsored by one of the large rubber manufacturers.

In charge of the research is a special committee at the university headed by Prof. Lewis Knudson, botanist, and including Dr. L. H. MacDaniels, floriculturist; Dr. Richard Bradfield, soil technologist; Dr. P. F. Sharpe, chemist; and Dr. C. E. F. Guterman, assistant director of the agricultural experiment station in Ithaca. Dr. W. C. Geer, noted rubber technologist, formerly associated with Goodrich, has placed the facilities of his private laboratory at the disposal of the investigators and will appraise the quality of the rubber that may be discovered.



In transporting guayule seedlings four men are used on a machine as seen above which prepares the hole and covers the seedling after it has been dropped by the workman. Each man can plant 60 seedlings a minute under this process. All the rest of the work is done by the machine itself, which was developed in the machine shop of the Intercontinental Rubber Co. Photograph, courtesy of General Tire.

Used Tires and Tubes Put Under Maximum Prices by the O.P.A.

As indicated in our previous issue, maximum prices at which used passenger car and truck tires and tubes may be sold were set by the Office of Price Administration on March 11, effective March 16. The price ceilings, contained in Maximum Price Regulation No. 107, are designed to preserve reasonable prices in the only remaining market for tires and tubes open to the ordinary citizen who cannot satisfy rationing regulation requirements for the purchase of new or retreaded tires.

As a guide in setting prices on used tires and tubes, the O.P.A. took into consideration the prices existing between October 1 and 15, 1941. Used tires are divided into four categories, depending on the depth of the tread design retained by the tire. Roughly, the amount of wear a tire has had determines the category into which it falls. Prices for a used 6.00-16, for example, range from $1.50 to $8.10, depending on the amount of wear. A new tire of this size would retail at about $14.75, in the four-ply style. Maximum price for passenger car tubes is $1.50 for all sizes, and for truck tubes $2.00 to $14.00, depending on size.

On selling a used tire or tube not mounted on a vehicle, the seller must furnish to the buyer a written statement showing the price, size, and type of the tire or tube sold; also whether a tire has been regrooved or retreaded or recapped. If it has been repaired or vulcanized, the purchaser must be told and the statement must also show whether a tire is a basic carcass or, if it is not, the depth measurement of tread design remaining. Records must be maintained by the seller.

In order to make the maximum prices for basic tire carcasses in the retread schedule conform to those in the used tire and tube regulation, O.P.A. issued Amendment No. 1 to Revised Price Schedule No. 66. This amendment involves changes only in respect to basic tire carcass maximum prices.

Freeze Retreading Equipment

In order to prevent duplication of facilities and a consequent waste of critical materials, the W.P.B. on March 11 ordered the suspension of production and delivery of tire retreading and recapping equipment except on preference-rated orders. The regulation, embodied in Limitation Order L-61, formalizes and makes more definite a directive issued on January 28 which prohibited manufacturers of such equipment from filling orders except those supported by preference rating certificates.

The new order requires that manufacture and delivery of this equipment be undertaken only upon a PD-1A certificate issued by the Director of Industry Operations, and that no sales, leases or transfers be made except upon similarly rated orders. Before issuing such certificates, the Director will consider a number of factors pertaining to the locality where the equipment would be delivered. It was emphasized that the order is not intended to apply to smaller equipment used in tire repair shops, such as tube vulcanizers, spreaders, jacks, buffers, and other specified equipment.

April Tire Quotas Announced

On March 24 the O.P.A. announced the quotas for April, making available for the first time a limited number of recapped tires to war workers and other passenger car owners on List B. A total of 470,317 recaps for passenger cars and motorcycles was made available.

The quota provided 101,636 new tires for passenger cars on List A and 285,977 new tubes for List A and B cars together, compared with 104,701 new tires and 87,635 new tubes in March, when no tubes were provided for List B passenger cars.

Truck tire quotas are somewhat larger than in March, reflecting better weather for industrial activity and commercial hauls. There are 275,523 new tires and 260,983 tubes made available for eligible trucks, buses, farm equipment and industrial tractors under the April quotas, against 256,385 new tires and 288,149 new tubes in March. Recapped truck tires in the April quota total 246,442, compared with 110,225 in the preceding month.

On March 28 O.P.A. announced that the tire recapping material made available for use on List B passenger cars was made almost wholly from reclaimed rubber, with only about 2% of new crude used in the mixture for cohesion. Tires recapped with this low-grade camelback should not be driven at speeds greater than 35 m.p.h.

In an earlier announcement, O.P.A. stated that total quotas of new tires released for passenger cars under the rationing program in the first three months of 1942 showed a reduction of almost 95% from the total replacement shipments reported by the R.M.A. in the corresponding period of 1941. Reflecting the relatively greater importance of truck and bus transportation, releases of new truck tire quotas in the first quarter of this year were only a little more than 27% below the total of replacement shipments in the first three months of 1941. In addition, 350,249 truck retreads were released in the first quarter of this year. No quota allotments were made for passenger car tire retreads in the 1942 quarter.

Amendments to Tire Regulations

Three new amendments to the Revised Tire Rationing Regulations have been announced up to this writing (April 13). Amendment No. 2, issued on March 16, contains provisions for an original allotment of 300 pounds of truck type camelback to retreaders and recappers for certain small gauge truck tire molds and additional allotments for retreading or recapping machines capable of treating more than one tire at a time. Under the amendment, each machine that can recap or retread two or more tires simultaneously will be allowed a maximum of 1,500 pounds of truck camelback instead of 750 pounds as originally provided.

This amendment also allots 300 pounds of truck type camelback to certain small truck tire size molds not originally provided for under the revised regulations. Each mold or curing table equipped with matrices capable of retreading or recapping truck tires 5.50-17 and 30x5 or larger, but which cannot handle sizes 7.50-20 or larger, is now eligible for an initial allotment of 300 pounds of truck camelback. Applications for supplementary allotment for multiple machines and for original allotment on small size molds were supposed to have been made through local rationing boards by April 1.

Authorizations for the necessary transfers under the "Tire Return Plan", which was described in the previous issue, by which dealers and jobbers may sell stocks of new passenger car tires and tubes back to manufacturers and mass distributors are contained in Amendment No. 3 to the Revised Tire Rationing Regulations. The effective date of this amendment was March 31.

Amendment No. 4, which goes into effect on April 10, contains authority under which retreaders and recappers will be able to get initial allotments of camelback for passenger car tires and local rationing boards may issue certificates of purchase for new tubes for List B passenger cars and trucks. It prohibits the application of truck type camelback to tires to be used on passenger cars and vice-versa. It also enables the retreader or recapper to bring his stock of camelback up to permitted levels.

Miscellaneous Tire Rulings

The following rules, regulations and interpretations pertaining to tires and tubes have also been announced:

The Office of Defense Transportation announced on March 12 that advice and assistance will be given to local business enterprises seeking to readjust local delivery services as a means of conserving trucks, tires, and other equipment and materials. Plans for pooling deliveries, curtailing services, or other joint action may be submitted to the O.D.T. for consideration and approval.

In order to keep the trailer industry effective as a provider of defense housing the W.P.B. has made available 4,000 tires and tubes to such manufacturers. A novel procedure, however, has been worked out in order to use these tires to the fullest possible extent. As soon as a trailer is delivered to a defense worker, the tires are removed and re-

turned to the trailer manufacturer for further "delivery" use. The trailer is generally propped up on wood blocks or timbers.

Farm tractors which were originally fitted with steel wheels but have changed to rubber tires will not be granted certificates to purchase tires whenever steel wheels are locally available and can be put back into service, the O.P.A. announced on April 6. Where the vehicle is already on rubber tires and no substitute wheels are available, certificates may be issued in the regular manner.

The O.P.A. said on April 7 that it has no objection to the issuance of purchase certificates for new tires of obsolete sizes to List B vehicle owners who have changed wheels and rims to permit use of those sizes. It warned, however, that the available supply of obsolete sizes is none too large and is not replaceable.

Tires will be made available to defense workers only when they cannot get to their jobs without them, O.P.A. stated on April 7. Price Administrator Henderson called upon defense workers to be just as thrifty as anyone else in the matter of tires.

O.P.A. ruled on April 7 that purchase certificates for tires to replace mud and snow tires now on vehicles may not be issued by local rationing boards except under conditions that ordinarily govern issuance of certificates. A number of vehicle owners with such tires on their cars have indicated a desire to switch to regular types during the summer months.

Production of farm tractors requiring rubber tires must be stopped after May 1 and the output of such tractors must be sharply curtailed between now and that date, according to Limitation Order No. L-26-a, issued by W.P.B. on March 10. April production must be cut by 60% below the base period provided in the order. This means that only some 8,000 rubber-tired tractors may be made this month.

Remolded Tires Under Ceiling

Amendment No. 1 to Maximum Price Regulation No. 107, establishing ceiling prices for remolded tires at the same levels as those applying to regrooved tires was announced by O.P.A. on March 27. The amendment also brings regrooved truck tires under the price ceilings by correcting a typographical error.

Firestone, Goodrich, Goodyear, and U. S. Rubber have agreed to rescind price increases put into effect on January 1, 1942, on tires sold as original equipment for automobiles and trucks of all types and to rebate to customers the amount collected in excess of the December 31, 1941, level, O.P.A. announced on March 18. Similar action was taken by the four in mid-January in regard to original equipment tires sold to manufacturers of farm machinery and equipment.

Advance New Retread Process

Officials of the Norwalk Tire & Rubber Co. demonstrated their "Victory Camelback" to representatives of the government at their Norwalk, Conn., plant on April 2. This camelback, according to these officials, requires but two ounces of crude, five pounds of reclaim and three pounds of non-strategic materials, and has been tested since last July on trucks and taxicabs. Representing the government at the plant were A. T. McPherson, chief of the rubber section of the Bureau of Standards, and Frank G. Roth, assistant physicist in the Bureau. Mr. McPherson said the Bureau will thoroughly test a sample tire retreaded with Norwalk's camelback, made in his presence at the plant.

A low-cost tire recapping process, which does not call for the use of crude rubber, is said to have been developed by the Newth Rubber Co., of Barrington, R. I. According to Frank Newth, president, tires with large amounts of tread on them, but with broken casings, would be stripped of their rubber. Tires with smooth surfaces, even with fabric showing but possessing solid inner walls, would be buffed and cemented. The tread from the tire with broken walls would then be applied to the good tire and placed in a retread mold and cured in the same manner as a retread. No answer concerning the method of avoiding overcure has been forthcoming.

Wooden Tires to Fore

The situation in the tire field has brought forth numerous suggestions for substitute tires, mostly made of wood. Dozens of ideas are presented to the Patent Office daily, but more than 95% are identical to methods which have been on file as far back as 1870, according to Elton Brown, chief of the research division. Some of them, however, have some merit.

For instance, the War Production Board is planning the experimental production of wooden tires wrapped with steel bands for use on trailers in defense areas. These tires, it is said, would be good for about 3,000 miles at speeds of 15 to 20 m.p.h. The trailer industry is also experimenting with tires made by placing steel rims over old tires.

A wooden tire made in eight sections, four on each side of the tire which is fitted tightly against the rim, has been developed by H. H. Johnson of Brookline, Mass. The sections overlap to prevent splitting and are held together by wooden pegs. Under the wood on the rim there is a channel filled with waste oil or water to keep the wood from shrinking and breaking off.

Glen Conrad, of Columbus, Ohio, has invented one made of heavy wedges of wood strung on a circular steel rod which tightens at either end with a nut. Another made of wood and surfaced with brake lining is the development of George K. Batt, Newark, N. J. Claude Habberstad, of Sheep Hill Park, N. J., has an all-wood tire which he claims will stand up under 75 m.p.h. Charles Danner, of Portland, Oregon, believes the best substitute for new tires is old tires. He bolted three casings, without inner tubes, together and traveled 60 miles at all speeds with no signs of trouble. Winding strong leather belting around tires will save the tires, according to Paul Kundig, of Santa Monica, Calif. He believes a nail-studded or wire-reinforced fabric composition can substitute for the leather belting and accomplish the same result.

Suit Against DuPont Dismissed

The suit filed by Arthur Diamond, a stockholder of the U. S. Rubber Co., against that company and E. I. du Pont de Nemours & Co., Inc., charging that DuPont held 19% of the rubber company's stock and "dominated" the company, and also requesting an accounting of funds and property allegedly wasted, was dismissed by Justice Ernest E. L. Hammer of the New York State Supreme Court on February 13. The court held that "the documents clearly and convincingly establish that the defendant DuPont company has not owned and does not own any stock, common or preferred, of the rubber company during the period mentioned in the complaint." The decision also dismissed charges against the directors and officers of U.S. Rubber, the court holding that the plaintiff had failed to show any fraud or bad faith and that documentary evidence presented by the defendants had disproved the charges.

To Manufacture Reclaimed Rubber

The Southwest Rubber Reclaiming Corporation has been organized in Fort Worth, Texas, for the purpose of manufacturing reclaimed rubber, according to Harold A. Sims, associated with that company. Although no details were made available, it is believed that the company is purchasing the necessary equipment and plans to start reclaiming operations in the next few months. Supplies of scrap in the southwest are understood to be considerable.

Canadian Representation Available

Reubins & Co., manufacturers' agents of 3457 St. Lawrence Blvd., Montreal, Canada, is interested in contacting American rubber manufacturers who are seeking representation in Canada on D. M. & S. contracts. Products covered by these contracts include molded, extruded and sponge rubber goods for aircraft, ordnance, ships, vehicles, instruments, etc. Correspondence should be directed to the company in Montreal.

WAYNE UNIVERSITY OF DETROIT, MICH., GIVES FORMAL ACCEPTANCE TO RUBBER AND PLASTICS PROJECT PROPOSED BY DETROIT RUBBER GROUP

Formal acceptance of the proposal advanced by the Detroit Rubber & Plastics Group, Inc., to establish a complete rubber and plastics laboratory at Wayne University, Detroit, Mich., as an adjunct to courses to be given at the University on rubber and plastics, has been made by the University and the Detroit Board of Education of which the University is a part, according to a letter received from John Dudley, chairman of the group's Educational Committee, dated March 18, 1942. There is quite a story behind that announcement.

Back in April of 1941 the Detroit Rubber & Plastics Group, then unincorporated, empowered its Executive Committee with the authority to formulate plans for a cooperative project on rubber and plastics with Wayne University. In a proposition forwarded to Dr. C. W. Selheimer, of the Department of Chemical Engineering of Wayne University, the group proposed to equip a rubber and plastics laboratory, complete with materials for experimentation, literature for reference, to supply lecture notes and lecturers at times as needed or requested, to maintain a committee to which questions may be referred for assistance in establishing a course on rubber and plastics technology, and to give actual training to one or more individuals in laboratory processing.

For its part, Wayne University was asked permission by the group to place the suggested project before its members at a meeting to be held on May 9, 1941, with the aim of soliciting equipment and funds from its members, with the understanding that the equipment, etc., would be the property of the University which would provide space for the work and equipment, and properly install and maintain it. Dr. Selheimer heartily endorsed the proposal to A. R. Carr, dean of the University's College of Engineering.

Now that official approval has been given to the project the Detroit group plans to complete the installation of equipment and have courses available at the University by September 1, 1942. These courses, according to present plans, will include the following:

(1) An introductory course covering the properties and testing of rubber and plastics; (2) Compounding, molding and testing of rubber and plastics; (3) Chemistry and advanced study of rubber and plastics; and (4) Research projects in both fields. With the exception of the latter, these would be semester courses, giving a knowledge of the fundamentals involved.

Because the project involves handling a large amount of money, the group has gone through incorporation procedures and is now known as the Detroit Rubber & Plastics Group, Inc. A detailed description of the group's proposal as presented to Wayne University, and which has received official sanction, follows:

Proposed Wayne University Equipment Project—Introduction of a Rubber and Plastics training course into the school curricula and the establishment of a complete Rubber and Plastics Laboratory in which experimental and research problems may be handled and in which students may be trained.

Equipment—Method of Requisitioning—All equipment is being requisitioned in the name of the Detroit Rubber and Plastics Group, Incorporated. This group is sponsoring the project of obtaining or providing the equipment for the proposed laboratory and under no condition will the name of the donor be mentioned without specific approval of same. This is being done in order to avoid undue or undesired publicity on the part of the donor or the school. If there is no objection to publicity by the donor, a brief note describing the project, its purpose, and the name of the donor will be included in our 1942 membership roster and a name-plate will be provided by the Group and attached to the equipment after it has been properly installed.

Instructions for Shipping—The donor of the equipment is requested to notify Mr. J. Dudley, c/o Chrysler Corporation, Engineering Division, 12800 Oakland Avenue, Detroit, Michigan, at least five days prior to the shipping date. All equipment should be sent direct to Wayne University, Detroit, Michigan, attention Dr. C. W. Selheimer. Shipping memo should be directed in duplicate to Mr. Dudley.

Priorities—The Defense needs may slow up our program if we adhere strictly to new equipment; therefore used equipment, provided it is reconditioned or worthy of reconditioning will be acceptable. In the event donors encounter difficulty in establishing priority ratings for the purchase of such equipment, the Detroit Rubber and Plastics Group should be notified immediately. Mr. Dudley will then take such steps as are necessary to establish priority ratings.

Donations of Books or Periodicals—Books, periodicals or manufacturers' technical literature related to the fields of rubber or plastics will be of help in the work. Back numbers of periodicals, particularly if in sets, will be of special value. Arrangements can be made to have journals and other publications bound by the Wayne University library.

Cash Donations—It is possible that some firms may wish to donate cash to this project, particularly those who have been asked to supply equipment they do not manufacture. A special account has been established for this purpose. Checks are to be made payable to: *The Detroit Rubber and Plastics Group, Incorporated, Wayne University Equipment Project,* and should be mailed to E. J. Kvet, c/o Baldwin Rubber Company, Pontiac, Michigan.

Course Material—In order to assist Dr. Selheimer to set up a course which will be most useful to the student and to the industry we represent, all members of the executive board have been requested to outline for him, along the proposed lines, a practical description of the work and fundamental training which in their opinion will produce the best trained rubber and plastics men. Dr. Selheimer will in turn summarize the material and present it to the executive board. Any suggestions that may be made by other interested individuals or companies will be appreciated. Suggestions for requirements should be put under the following headings, whether they apply to rubber, plastics, synthetic rubber or adhesives:

Theory

1. Chemical Aspects
2. Physical Aspects

Application

1. Formulation
2. Processing
3. Testing

Donations Already Made

Since work on the Wayne University project started, the Detroit Rubber & Plastics Group, Inc., has already received a number of donations, some of which have been delivered and some of which is promised for early delivery. These include the following:

Hydraulic press, 24" x 24"
Torsion balance and weight
Laboratory ball mill
Laboratory size calender
Cement mixer
Oxygen bomb
Laboratory oven
Test block mold
Nine cavity adhesion test disc mold
A number of cash donations
Ames thickness gauge
Trimming scissors
Mill knife
Rubber cutting knife
Tensile test dies
Adhesion test dies
Crescent tear test dies
Four cavity tensile sheet mold
Essential raw materials for rubber compounding plus containers

Additional Equipment Needed

Following is a list of equipment which would be welcome by the Detroit group in carrying out the aims of the course:

A. *Mixing Equipment*
   1. Banbury Mixer
   2. Rubber Mill 12"
   3. Baker Perkins Mixer
B. *Processing Equipment*
   1. Calender—13"
   2. Extruder #1
   3. Ball Mill (Day)
C. *Vulcanizing Equipment*
   1. Hydraulic Press 24"
   2. Pot Vulcanizer
D. *Testing Equipment*
   1. Shore Durometer
   2. A.S.T.M. Hardness Tester
   3. Randall-Stickney Gauge
   4. Williams Plastometer
   5. Scott Tensile Machine

D. *Testing Equipment (Cont'd)*
6. DeKhotinsky Oven
7. Cenco High Temperature Drying Oven
8. Oxygen Bomb
9. Link Gauge
10. Ames Thickness Gauge
11. Compression Set Jigs
12. Goodrich Flexometer
13. P. and J. Plastometer
14. Viscosimeter
15. Oscillograph (Yerzley)
16. Firestone Penetrometer
17. Carver Press—6″

E. *Maintenance Equipment*
1. Gas Fired Steam Boiler
2. Pressure Pump for Hydraulic Press
3. Sinclair Pressure Valve
4. Ventilating Fan
5. Power's Regulator

F. *Tool Equipment*
1. Small Arbor Press
2. Bench Vise
3. Rubber Cutting Knife
4. Mill Knives
5. Scissors (Press)
6. Scissors (Trimming)
7. Rubber Punches—A.S.T.M.
   a. Tensile Dumbell Die ¼″
   b. Tensile Dumbell Die ⅛″
   c. Crescent Tear Test Die
   d. Adhesion Die for Raw Stock 2″ dia.
   e. Compression Set Cutting Die
8. Rawhide Hammer
9. Small Drill Press

G. *Temperature Control Equipment*
1. Press Controls
2. Banbury Controls
3. Mill Controls
4. Calender Controls
5. Extreme Controls

H. *Electrical Equipment*
1. Motors
2. Electric Controls

I. *Chemical Equipment*
1. Constant Temperature Bath
2. Industrial Fume Hood—B type Alberine Shell Stone—6′ long
3. File Top Cabinet
4. Chemical Case (R-625)
5. Laboratory Stools

J. *Analytical Equipment*
1. Torsion Balance and Weights #255
2. Analytical Balance and Weights
3. Microscope

K. *Stock Handling Equipment*
1. Shelving
2. Cabinets
3. Table (Steel) for Compounding
4. 1 Gal. Round Cans (500 required)
5. 1 Gal. Solvent Cans (Screw top) (500 required)

L. *Mold Equipment*
1. Tensile Sheet Mold
2. Test Block Mold (½ x 3 x 3)
3. Test Disc Mold (Adhesive)

M. *Stock Materials*
1. Initial Supplies (Rubber and Rubber Compounding Materials)

N. *Miscellaneous Equipment*
1. Laboratory Time Clock
2. Rubber Lined Plastic Tank
3. Cone Drive Stirring Motor
4. Bates Numbering Machine
5. Rooves Type Embossing Press

O. *Special Plastics Equipment*
1. Resin Still and Controls
2. Ball Mill
3. Grinder
4. Izod Impact Machine
5. Test Screws
6. Portable Pyrometer
7. Flow Test
8. Molds for A.S.T.M. Test Pieces
9. Scales

History of the Group

The Detroit Rubber & Plastics Group, Inc., was organized in 1937, with a nucleus of 12 members drawn from the rubber and motor companies, as the Detroit Rubber Group. In 1940 the group was expanded to include those interested in plastic technology and the name changed to the Detroit Rubber & Plastics Group. Because of the Wayne University project it was recently incorporated.

The group now has approximately 450 members on its roster. Like all local rubber groups, the membership is open to anyone interested in the technical phases of the rubber and plastic industry. Four meetings are held each year, three of them being given over to prominent technologists in the field of rubber and plastics, while the fourth is generally addressed by a prominent speaker on civic or economic subjects.

Present officers of the group are J. H. Doering (Ford Motor), chairman; W. B. Hoey (Bakelite Corp.), vice-chairman; E. J. Kvet (Baldwin Rubber), secretary-treasurer; and W. G. Nelson (U. S. Rubber), counselor. W. M. Phillips (General Motors) is honorary chairman.

Many Cooperating in Project

The faculty at Wayne University cooperating in the rubber and plastics project include David D. Henry, executive vice-president; Arthur R. Carr, dean of the college of engineering; C. W. Selheimer, assistant professor of chemical engineering; G. W. Kingsbury, director and associate professor of advertising; and W. Vreeland, director of the division of publications. Others taking an active interest include the following: H. E. Simmons, president, Akron University; H. I. Cramer, Sharples Chemical Co.; R. A. Seaton and H. M. Crothers, U. S. Office of Education; R. B. Stringfield, University of Southern California; Ivan C. Crawford, A. H. White and A. E. White, University of Michigan; Webster N. Jones, Carnegie Institute of Technology; and John S. Sullivan, Ohio University.

A portion of the Bell Telephone Laboratories, including the rubber laboratory, has been moved from New York City to Murray Hill, N. J., about 2 miles from Summit.

NEW RUBBER CHEMICALS RECENTLY INTRODUCED

Arazate (zinc dibenzyl dithiocarbamate) — an ultra accelerator with properties corresponding to Naugatex 275, but producing a more stable and uniform water paste for latex compounding. Naugatuck Chemical.

Pipazate (zinc pentamethylene dithiocarbamate) — an ultra accelerator with properties corresponding to Naugatex 144, insoluble in water and readily prepared in paste form for use in latex. Naugatuck Chemical.

Methazate (zinc dimethyl dithiocarbamate) — an ultra accelerator which has its principal use in wire insulation for the continuous vulcanization process. Naugatuck Chemical.

Ethazate (zinc diethyl dithiocarbamate) — an ultra accelerator which, like other accelerators of this class, shows great activity in the low temperature range. Naugatuck Chemical.

Morfex (thiazole-thiuram mixture)— an ultra accelerator, first developed as an accelerator for C. V. wire. Not recommended for very low sulfur compounds, but is highly satisfactory for compounds containing 0.6% sulfur or more. Naugatuck Chemical.

Butasan (zinc salt of dibutyl dithiocarbamic acid) — an accelerator, cream-colored in appearance, specific gravity 1.24, melting point 106°C., cures at temperatures below 100°C. Finds application in latex, cements, dipped goods, adhesives, etc. Monsanto Chemical Co.

Ethasan (zinc salt of diethyl dithiocarbamic acid) — an accelerator, white in appearance, specific gravity 1.5, melting point 173°C., used in latex compositions. Monsanto Chemical Co.

Methasan (zinc salt of dimethyl dithiocarbamic acid) — an accelerator, white in appearance, specific gravity 2.0, melting point 249°C., cures at temperatures below 100°C., used in latex compositions and cements. Monsanto Chemical.

A-46, an accelerator consisting of a constant composition blend of Santocure and El Sixty, light tan in appearance. Monsanto Chemical Co.

Channel S, a two-purpose material composed of a channel type carbon black and a plasticizer for use with the butadiene type of synthetic rubbers. Imparts good tubing and calendering properties. R. T. Vanderbilt Co.

Namate (sodium salt of diethyl dithiocarbamic acid) — an accelerator with many specific advantages for rubber and latex compounding. R. T. Vanderbilt Co.

Ty-Ply SC, a self-curing adhesive for bonding unvulcanized self-curing rubber or vulcanized rubber or latex to steel at room temperature and atmospheric pressure. R. T. Vanderbilt Co.

Bunnatol G and *S*, plasticizers for synthetic and reclaimed rubber, said to be superior to dibutyl phthalate. Also act as wetting agents for pigments, allowing a minimum of milling and grinding for maximum dispersion throughout the stock. Beacon Co.

Palmalene, a new synthetic palm fatty acid of medium titre, which finds application in rubber compounding. Saponification number 180-185, iodine value 55-60, titre 35. Beacon Co.

Witco Blancal, a precipitated barium-calcium compound, a replacement material for blanc fixe. Due to higher bulking value less is needed in formulations. Available in both low and high oil grades. Wishnick-Tumpeer, Inc.

Foamapin Liquid, a new foaming agent for technical purposes, compatible with latex, dextrin, algin and starch. Addition of small percentages of wetting agents gives increased surface tension reducing properties and results in a foam said to be superior to most grades of saponin. Glyco Products Co.

CLASSIFICATIONS PROPOSED BY AUTOMOTIVE RUBBER COMMITTEE

A special meeting of Subcommittee IV on Rubber Conservation of Technical Committee A on Automotive Rubber of Committee D-11 on Rubber Products of the A.S.T.M. was held in Detroit on March 19 for the purpose of discussing the completion of proposed classification of rubber qualities. The final Rubber Qualities Chart agreed upon by those present at the meeting, which the subcommittee proposes to forward to the S.A.E. for publication, is reproduced herewith.

The following members of the subcommittee were present at the meeting: J. D. Morron (U. S. Rubber), E. J. Kimmich (Goodyear), A. J. Kearfott (General Motors Research), J. H. Doering (Ford Motor), H. Wening (Inland Mfg.), E. J. Schwartz (Republic Rubber), W. J. McCortney (Chrysler Corp.), and J. C. Dudley (Chrysler Corp.). Mr. McCortney is chairman and Mr. Dudley is secretary of the subcommittee.

The main object of the program delegated to Technical Committee A on Automotive Rubber was the conservation of rubber by means of restriction of specifications. It is hoped that these specifications will be followed as closely as possible by the automotive, aeronautical and allied industries. It was agreed by all concerned that the number of rubber specifications could be very largely reduced so as to simplify the rubber compounding problem. It was suggested that rubber stock specifications be drawn up which would cover the whole range of properties needed in manufacturing rubber articles and after these various standard specifications had been set up the suitability of them for special applications be also investigated. General application of the compounds shown on the Rubber Properties Chart are now being determined.

During the course of meetings the following recommendations were made:

It was suggested that bumper and grommet compounds be standardized at once in order to get quick results. It was also suggested, but not voted upon, that no additional stocks be added after the list was once drawn up except by committee agreement. It is understood, of course, that different companies will have different stocks to meet stock specifications, as no standardization of compound is attempted, only standardization of physical properties and of methods of test.

It was moved, seconded and approved: That Shore Elastometer readings be eliminated from all specifications; That all ash requirements be eliminated from the specification; That color be not made mandatory in general specifications; That only minimum tensiles be used in the classification; That the Committee accept the load-deflection figures as verified by Sub-Committee IV; and That tensile strength figures be accepted as verified by Sub-Committee IV.

Proposed Classification of Rubber Qualities For Automotive Use

(as revised at Sub-Committee IV Meeting on March 19th, 1942)

Classification Number	Hardness: Shore Durometer ± 5 "Approximate"	Hardness: ASTM D-314-39	Minimum Tensile Strength lbs./sq. in. D-412-41	Minimum Elongation, %	20% Load Deflection lbs./sq. in. D-575-40T	Maximum Compression Set % 22 Hours D-395-40T
R300 B	30	150 ± 20	....	...	.....	25
R309	30	150 ± 20	900	500	.....	*
R315	30	150 ± 20	1500	600	70 ± 10	*
R320	30	150 ± 20	2000	600	70 ± 10	*
R330	30	150 ± 20	3000	700	70 ± 10	*
R400 B	40	105 ± 15	....	...	.....	25
R405	40	105 ± 15	500	300	.....	*
R409	40	105 ± 15	900	500	.....	*
R415	40	105 ± 15	1500	500	100 ± 15	*
R420	40	105 ± 15	2000	500	100 ± 15	*
R430	40	105 ± 15	3000	600	100 ± 15	*
R500 B	50	80 ± 10	....	...	.....	25
R506	50	80 ± 10	600	300	.....	*
R509	50	80 ± 10	900	300	.....	*
R515	50	80 ± 10	1500	400	140 ± 20	*
R525	50	80 ± 10	2500	500	140 ± 20	*
R535	50	80 ± 10	3500	600	140 ± 20	*
R600 B	60	60 ± 8	....	...	.....	25
R606	60	60 ± 8	600	300	.....	*
R609	60	60 ± 8	900	300	.....	*
R615	60	60 ± 8	1500	350	195 ± 30	*
R620	60	60 ± 8	2000	400	195 ± 30	*
R625	60	60 ± 8	2500	450	195 ± 30	*
R635	60	60 ± 8	3500	550	195 ± 30	*
R700 B	70	45 ± 7	....	...	.....	25
R703	70	45 ± 7	300	100	.....	*
R704	70	45 ± 7	400	150	.....	*
R706	70	45 ± 7	600	200	.....	*
R709	70	45 ± 7	900	250	.....	*
R715	70	45 ± 7	1500	300	285 ± 50	*
R720	70	45 ± 7	2000	350	285 ± 50	*
R730	70	45 ± 7	3000	450	285 ± 50	*
R804	80	28 ± 7	400	100	.....	*
R806	80	28 ± 7	600	150	.....	*
R809	80	28 ± 7	900	200	.....	*
R812	80	28 ± 7	1200	250	.....	*
R820	80	28 ± 7	2000	250	450 ± 75	*
R825	80	28 ± 7	2500	300	450 ± 75	*
R907	90	13 ± 7	700	75	*	*
R915	90	13 ± 7	1500	200	*	*

Explanation of Proposed Rubber Properties Chart

Prefix letter of classification number indicates "rubber."

Use: Suffix letter "A" indicates general purpose rubber compounds for which compression set or special aging is not required or designated. Suffix letter "B" indicates rubber compounds with maximum compression set requirements. Suffix letter "C" indicates rubber compounds adapted for outdoor aging. Physical Properties specified in the Chart are based on test specimens having an equivalent cure of the part in question rather than the optimum cure and the physical properties of the part correlated with the test specimens.

Hardness: First digit of Classification Number indicates the approximate Shore Durometer Hardness. Hardness specified shall be determined by A.S.T.M. test method D-314-39.

Tensile Strength: Second and third digits of Classification Number indicate minimum strength. Tensile and Elongation specified shall be determined by A.S.T.M. test method D-412-41.

Load Deflection: Load Deflection specified shall be determined by A.S.T.M. test method D-575-40T.

Compression Set: On compounds R300 B, R400 B, R500 B, R600 B, and R700 B the compression set shall not exceed 25%. When "B" designation is used on any other compound, the compression set shall not exceed 50%. Attention is called to the new A.S.T.M. test method D-395-40T (Method B) which is based on compressed thickness of specimen rather than the original thickness. Maximum compression set specified shall be determined by the new method. Research is in progress on the use of other limits of time and temperature. As a reference check A.S.T.M. test procedure D-395-40T method B may be extended to 70 hours with comparable limits of compression set.

Aging: Tensile and Elongation deteriorations shall not fall below 15% original values of any compounds after 72 hours at 158° as per A.S.T.M. test method D-573-41, accelerated aging.

Color: Color is not specified in any of the above classifications but should be black whenever possible and without bloom that may have an adverse effect on the aging of the compound.

It was moved and seconded that the work on bumpers be superseded by the classification work of Sub-Committee IV and that the research project on bumpers be deferred to a more convenient date. It was moved, seconded and approved that the classification system for rubber stocks be adopted, using letters to indicate stocks for various purposes.

A list showing the location of all A.S.T.M. hardness testing instruments will be circulated by Mr. L. V. Cooper's Committee. It is recommended that all interested parties have their durometers checked with the A.S.T.M. Hardness Testing Instrument in their locality for correlation purposes. A copy of the correlation curve should then be forwarded to Mr. Cooper. Sub-Committee IV was advised when ready to report to take up their recommendations with the S.A.E., A.S.T.M., and A.S.M.E.

It was suggested that cooling system hose be standardized by Sub-Committee IV. The secretary was instructed to consult with Mr. Warner of the S.A.E. for information as to what may be expected available for anti-freeze material in the near future. This item falls under the jurisdiction of Sub-Committee V on Synthetic Rubber and has been referred to the S.A.E. War Engineering Board.

The Chairman was authorized by the Committee to also appoint a Sub-Committee to standardize specifications for synthetic compounds. This committee to be known as Sub-Committee V. The S.A.E. was requested to send out a letter similar to that circulated by Sub-Committee IV requesting any suggestions or ideas which might be applied to the simplification of the work of Committee V on Synthetic Compounds. The simplification program being conducted by the Synthetic Rubber committee is nearing completion and will be brought before the April meeting of Technical Committee A for approval.

STEVENS AND SIDNELL HEAD AKRON RUBBER GROUP

T. L. Stevens, of the C. P. Hall Co., and A. E. Sidnell, of the Seiberling Rubber Co., were elected chairman and vice-chairman, respectively, of the Akron Group, Rubber Division, A.C.S., at a meeting of the group held at the City Club in Akron on March 20. W. J. Krantz, of the Goodyear Tire & Rubber Co., was elected secretary-treasurer. Approximately 200 members and guests attended the meeting.

In addition to the election, the meeting featured an interesting lecture on application of radiations from filament and gaseous sources, delivered by Mr. Weitz of the General Electric Co. Mr. Weitz demonstrated the newer types of lighting equipment and discussed their value in our everyday life. A very pertinent example was color and the kinds and degree of light available for effective blackouts.

ONTARIO RUBBER GROUP HEARS TALKS BY CROSBY AND MARTIN

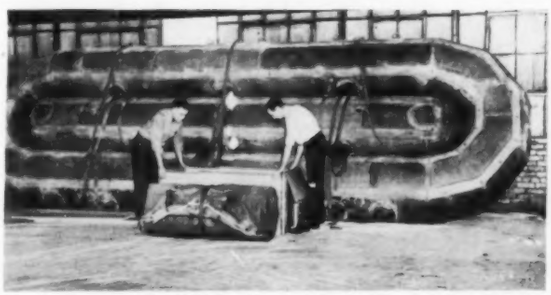
Talks by J. W. Crosby, sales manager of the Thiokol Corp., and J. A. Martin, rubber controller for Canada, featured a meeting of the Ontario Rubber Section of the Canadian Chemical Association held at the University of Toronto in Toronto, Canada, on March 19. Election of officers for the 1942 season also took place.

Taking as his subject "Synthetic Rubber," Mr. Crosby briefly outlined the history of synthetics from the last war, when Germany introduced methyl rubber, to present day types. He also discussed some processing difficulties and the specific advantages offered in this connection by various synthetics. In concluding his talk, Mr. Crosby reviewed some of the uses to which the synthetics have advantageously been put, such as in the production of certain types of hose, oil-resisting gaskets, barrage balloons and bullet-proof gas tanks.

The steps taken by the Canadian Government to conserve rubber supplies in the Dominion were reviewed in the talk given by Mr. Martin. He explained the function of the Fairmont Co., the concern organized by the government to control the supply of rubber, and then discussed conservation steps taken to date. Methods of collecting scrap were also reviewed.

The elections resulted in the selection of J. C. Howard, of the Kaufman Rubber Co., Kitchener, as chairman, and J. Ramsay, of the Gutta Percha & Rubber Co., Toronto, as secretary-treasurer. Dr. Norman Grace (Dunlop Tire), R. M. Ferguson (Naugatuck Chemical), and G. H. Arnold (Boston Insulated Wire) were named members of the Program Committee.

GOODYEAR BUILDS INFLATED BOATS FOR UNCLE SAM'S ARMED FORCES



TOP—Balloon room workers applying finishing touches to large quantity of inflatable life rafts made by Goodyear for U. S. Navy. Boats are same type as that used by three naval men who survived 34 days adrift on the Pacific.

CENTER—Using massive rubber pontoons like the one shown, and heavy steel treadways, the new U. S. Armored Force bridge can be erected faster and carry heavier loads than any other military bridge in existence. It can be used to form rafts for ferrying or be erected as a complete bridge capable of transporting the heaviest army loads. In background, pontoon is shown inflated; in foreground, it is seen rolled for packing into case used for shipment when deflated.

BOTTOM — Assault boats for U. S. Marines are shown in near-complete form. While designed for tough, rugged, abusive service, these boats when deflated are the ultimate in compactness and are extremely light in weight in relation to the loads they carry.

COMMITTEE D-11 ON RUBBER PRODUCTS MEETS IN CLEVELAND; HEARS REPORTS FROM SUBCOMMITTEES AIMED AT CONSERVATION

The critical situation with respect to crude rubber and limited supplies of reclaim was the undercurrent which motivated some of the most important actions ever coming from Committee D-11 on Rubber Products of the American Society for Testing Materials at a meeting of that committee held during A.S.T.M. Committee Week in Cleveland, Ohio, last month. The rubber committee met on Wednesday, March 4.

A group of technical authorities representing both consumers and producers of many products, in which rubber is an important element, conscious of their deep responsibility in conserving wherever possible the present supplies, reached accord on numerous alternate emergency provisions which will be pushed through the Society's procedure immediately with publication of the details scheduled within the next few weeks.

One of the highlights of the meeting was an important report on a Cooperative Test Program on Accelerated Light Aging of Rubber which in the opinion of one of the officers present represented a very substantial beginning of active progress and advancement in this field. Specific reports made follow:

Specific Subcommittee Reports

Mechanical Rubber Hose (Subcommittee I): While no recommendations were received on fire hose, the committee plans to develop emergency alternate specifications after the section in charge has reported on revisions under way.

Insulated Wire and Cable (Subcommittee V): One of the most active groups was concerned with insulated wire and cable. A special section which had devoted considerable time and effort in reviewing the current specifications offered several emergency changes in the interest of conservation. These actions include a reduction in the electrical and physical properties which must be met by the rubber compounds for insulated wire and cable, class AO, 30 per cent Hevea type, with related action in heat-resisting rubber compound wire and cable and the ozone-resistance type of insulation. Other matters involving changes in sections cover the conductor material.

Approval of action taken on electrical conductors conserving tin and a provision that a cable tape needs to be frictioned on one side only instead of the present requirement of both sides, with an insulated compound that is not injurious, were other matters acted on. As an example of reduction in physical properties in D 353—41, Performance Rubber Compound, the tensile strength for rubber insulation is being reduced from 1200 to 850 psi. and the electrical constant lowered from 4000 to 2000.

To make available requirements for rubber sheath for cords and cables for use where extreme absorption is not encountered a complete emergency alternate specification was approved setting up a tensile strength minimum of 1800 psi., a maximum set in 2-in. gage length of ⅜ in. Elimination of the tensile strength requirement (500 psi. minimum at 200% elongation) and reduction in the aging requirements was set up in the standard for so-called tough jacket compound covered by Standard D 532. This specification requires a minimum tensile strength of 3500 psi. and ¼-in. set.

No action was taken on the recommendation of the test section which had been investigating moisture absorption test. A later report is anticipated.

Abrasion Tests for Rubber Products (Subcommittee XIV): The research work on abrasion tests for rubber products is to be continued with a program under way on correlation of the Williams and Bureau of Standards type of machines. Tests for cord belting are under consideration and further discussion of this matter will ensue.

Packings (Subcommittee VI): The meeting of the subcommittee on packings was featured by a most interesting paper presented by F. C. Thorn (of the Garlock Packing Co.) on "A Reciprocating Test Machine". This paper is scheduled for early publication in the *A. S. T. M. Bulletin* and is of important emergency interest because of the necessity of a satisfactory and quick method of evaluating packings. Considerable progress was reported in the development of test methods for compressed asbestos sheets with indication that they would be ready for action in June. This work in which contact was made with the Society of Automotive Engineers is of considerable interest in aircraft work. Treated paper packings using synthetic resins are to be studied immediately and test methods prepared.

Tests of Liquid Rubber Products (Subcommittee XXI): The committee concerned with tests of liquid rubber products reviewed the method for Sampling and Testing Rubber Latex (D 640—41 T) with favorable comments resulting. This group also acted to request the adoption of the standard on rubber cements (D 553) issued in 1939. Since quite a number of interests have been anxious to obtain the falling cylinder viscosimeter required in D 553, and with present conditions making it difficult for the instrument maker to supply this, an effort is to be made to have this situation ameliorated.

The work on developing tests for adhesive strength of rubber and rubber-like films is being advanced and considerable progress will be reported in June. Special work will be done on adhesion tests in conjunction with cemented balloon seams.

In the work on hard rubber, the section on physical testing will attempt to complete a new round robin test program on tensile testing in time so that results can be presented at the annual meeting in Atlantic City. These also will provide a check on the reliability of the test methods covering hard rubber products.

Testing Asphalt Composition Battery Containers: There was much discussion on the now increasingly important tests for asphalt composition battery containers on which the committee had received a number of comments from the National Bureau of Standards. A number of suggestions will be incorporated into the tests issued last year and others are to be considered further with the Bureau. In view of the probable increase in the use of asphalt containers the speed of testing is of extreme importance and discussion brought out the soundness of the requirement in D 639 of the rate of travel of the jaw of 0.2 in. per min. instead of 0.4 in. per min. as specified in the usual tensile test of rubber products.

Accelerated Aging of Rubber: As previously indicated there was intense interest in the report on Accelerated Light Aging of Rubber as presented by J. H. Ingmanson (of the Bell Telephone Labs.), Chairman of the subcommittee. There was extensive tabular data and diagrams in the report. Ten laboratories cooperated in the work using three existing commercial testing machines and some laboratories conducted outdoor exposure tests. Material covered included neoprene, tire tread, hose cover, sidewall, insulation, and so forth.

Another phase of this aging program was correlating the results using a temperature in the bomb aging test (D 572) at 70° C. with 80° C. The existing requirement of 70° C. is to be retained, withdrawing a proposed provision setting up 80° C. as the temperature; but in line with this action revisions will be proposed in the methods so that an 80° C. temperature will be incorporated as alternate in the oxygen bomb test (D 572) and 90° C. alternate in the oven method (D 573), as compared with figure of the present 70° C. operating temperature.

Report on Hardness Testing

Hardness Testing: The subcommittee concerned with rubber products for absorbing vibration is definitely interested in hardness testing and has followed closely the work of Technical Committee A (jointly sponsored by A.S.T.M. and S.A.E.) covering automotive rubber. A report from the latter was approved with its recommended proposed method of test using the durometer; this is to be approved as an emergency method. A report and details appear in the *A.S.T.M. Bulletin* for March, 1942.

The committee plans to establish standard instruments in some ten laboratories for assistance in calibration and checking other instruments and then with careful standardization of the indentor, spring calibration and other essential points, to make use of the instrument at least during this emergency period.

SERIES OF RUBBER LECTURES OFFERED BY YALE UNIVERSITY

Some time ago the U. S. Office of Education inaugurated the National Defense Training Program for the purpose of training engineers for specific jobs in industry. This program is now being conducted by engineering schools throughout the country. Since January, Yale University has been conducting classes in a division of this program known as the Engineering, Science and Management Defense Training, under the supervision of Professor Carl Hancey.

About four months ago the University began the organization of a course in rubber technology, keyed to the special program. Since the attack on Pearl Harbor, however, the outlook for rubber has changed considerably, with the result that the program was changed to deal with the immediate problems of the rubber industry. Some lectures have already been given, others are scheduled for future presentation.

Dr. Ernst A. Hauser of M.I.T. has already given three lectures, the first in the nature of a general introduction to the field of rubber technology and the next two on the chemistry of rubber. He will give an additional lecture on natural and synthetic latex on April 22. Dr. R. H. Gerke of the U. S. Rubber Co. has also delivered a lecture on the physics of rubber, as has Dr. A. A. Somerville of the R. T. Vanderbilt Co., on rubber compounding. Reclaimed rubber was the subject of a lecture by Dr. Paul Elliott of Naugatuck Chemical scheduled for April 8 while one on the crude rubber of South America, by W. J. O'Brien, Jr., of the Seamless Rubber Co., was scheduled for April 15.

A number of lectures are planned for the immediate future. On April 29, F. H. Banbury of the Farrel-Birmingham Co. will discuss rubber equipment and processing. Dr. H. Mark of Brooklyn Polytechnic Institute will lecture on the mechanization of the polymerization process on May 6 and on the properties of polymers on May 13. The Buna type of synthetic rubber is the scheduled topic for May 20 and Vistanex and Butyl Rubber for May 27. Dr. Per K. Frolich of the Standard Oil Development Co. has been invited to deliver both of these lectures.

Scheduled for June 6 is a lecture on Ameripol and Hycar, which will be delivered by Waldo L. Semon or some other member of the Hycar Chemical Co. Dr. S. M. Martin, Jr., of the Thiokol Corp., will discuss Thiokol on June 10. E. R. Bridgwater, of DuPont, has been invited to deliver a lecture on neoprene on June 17, while on June 24 D. E. Fowler of Naugatuck Chemical will lecture to the group, probably on rubber dispersions. The final lecture of the course will be given on July 1 and will be devoted to guayule. No speaker has yet been obtained for this subject.

As offered at present, these classes consist of intensive, part-time evening courses conducted at a college level. The enrollment has been restricted to qualified persons whose training in the fields of engineering, science and management will increase their usefulness to the national war effort. The entire program is financed by the government and is offered without tuition fees to men engaged in war work. Further information can be secured from Dr. Carl Hancey, Assistant Supervisor, Engineering, Science and Management Defense Training Program, Yale University School of Engineering, 15 Prospect St., New Haven, Conn.

Coming Events

Apr. 20-24. 103rd Meeting, A.C.S. Memphis, Tenn. (Note: The Division of Rubber Chemistry will not meet in Memphis. The next meeting of the Division will be held in Buffalo next September).

Apr. 30. Joint Meeting of Buffalo and Canadian Rubber Groups, General Brock Hotel, Niagara Falls, Canada.

May 1. Chicago Rubber Group, Congress Hotel, Chicago, Ill.

May 5. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Calif.

May 8. Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

May 8. Quebec Rubber & Plastics Group, McGill University, Montreal, Canada.

May 11-13. American Institute of Chemical Engineers, Boston, Mass.

May 15. New York Rubber Group, Building Trades Club, New York.

May 31. S.A.E., Annual Summer Meeting, Hotel Greenbrier, White Sulphur Springs, W. Va.

June 22-26. A.S.T.M., 45th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 7-11. 104th Meeting, A.C.S., Buffalo, N. Y. Rubber Division Headquarters: Hotel Lafayette.

Nov. 17-22. Second National Chemical Exposition, Stevens Hotel, Chicago, Ill.

C. E. Clark Named President

Clarence E. Clark, formerly vice-president of Whittaker, Clark & Daniels, Inc., of New York City, importers, manufacturers and exporters of minerals, colors and pigments for over 50 years, has been elected president of that company to succeed his father, Samuel H. Clark, who died last November. Harold G. Robinson and W. Wallace Roff were elected vice-presidents, and John A. Franklin, secretary-treasurer.

BOSTON RUBBER GROUP HEARS P. ELLIOTT AND J. BICKNELL

Approximately 250 members and guests of the Boston Group, Rubber Division, A.C.S., turned out for a meeting of that group held at the University Club in Boston on April 10 to hear talks given by Dr. P. M. Elliott, of the Naugatuck Chemical Division of U. S. Rubber Co., and J. W. Bicknell, managing director of U. S. Rubber's plantation division. The famous Thaw-Asia color films were also shown.

Dr. Elliott's talk was quite similar to the one he presented before the New York Rubber Group on reclaimed rubber on March 20 (a report of which appears elsewhere in this issue) and was accompanied by the showing of colored slides tracing the manufacture of reclaim at the Naugatuck Chemical plant at Naugatuck, Conn. His remarks on the compounding of reclaim, as given before the New York Group, appear on page 35 of this issue.

Although the announced title of Mr. Bicknell's talk was "The Rubber Plantation Situation in Malaya," the U. S. Rubber executive discussed the present rubber situation from many angles. He first showed a movie of the U. S. Rubber plantations in Malaya taken 15 years ago, and then stated that he seriously doubted whether many of the trees on those plantations were actually destroyed in the "scorched earth" policy prior to the Jap invasion. He did say, however, that storage tanks and processing equipment were probably destroyed. Although U. S. Rubber has not had any recent word as to the status of the plantations, several of the company's men have arrived within recent weeks from Sumatra.

Referring to the position of Ceylon and India in the present picture, Mr. Bicknell stated that if any rubber is shipped from these countries it will probably go to Russia or Australia. While we can count on the expansion of guayule production in Mexico, he said, supplies will probably be far less than the optimistic figures recently quoted in the press. The situation in South America with regard to crude rubber is still very much unsettled, in his belief, and several kinks are yet to be straightened out between our State Department and various Latin American governments. Because of these situations, Mr. Bicknell stated that synthetic rubber is the only answer to our immediate problem of rubber supply.

At a brief business session held during the meeting, the group voted to hold an outing as usual next June. Prizes will be distributed at the outing as in the past.

Hecht, Levis & Kahn, Inc., crude rubber dealers and importers, have moved their offices from 99 Wall Street to 76 Beaver Street in New York City.

NEW YORK RUBBER GROUP HEARS ELLIOTT AND MARK

Dr. P. M. Elliott, of the Naugatuck Chemical Division of U. S. Rubber Co., and Dr. H. Mark, professor of organic chemistry at the Brooklyn Polytechnic Institute, were the principal speakers at the Spring Meeting of the New York Group, Rubber Division, A.C.S., held at the Building Trades Club in New York City on March 20. Approximately 300 members and guests attended the meeting.

The subject of Dr. Elliott's talk was the "Position of Reclaimed Rubber in a War Economy." He first made reference to the critical situation in which the entire non-Axis world finds itself with regard to crude rubber supplies due to the Japanese victories in the Far East, and then quoted figures recently used by Leon Henderson before the Senate indicating that based on requirements of 2,000,000 tons of crude rubber in 1942 and 1943 the non-Axis world faced a deficit of 420,000 tons in the latter year. This deficit was based on a production of only 165,000 tons of synthetic rubber produced in 1943. Probable production figures quoted in recent weeks are considerably in excess of this figure.

Dr. Elliott then went on to a discussion of where and how reclaimed rubber fitted into the present jig-saw puzzle and to what extent it can relieve the shortage of crude rubber. Among the factors which will limit the use of reclaim, he said, are the supplies of scrap rubber available for processing and the actual productive capacity of the reclaiming plants. To give his listeners a better idea of the reclaiming process, Dr. Elliott then showed a number of colored slides tracing the manufacture of reclaim from start to finish at the Naugatuck Chemical plant.

In concluding his talk, Dr. Elliott made reference to the fact that reclaimers can vary their processes in many ways and so can control the properties of the product to give many special characteristics to the finished reclaim. He listed several of the controllable factors. He then discussed the fundamental principles of compounding reclaim. This portion of his talk is published in full elsewhere in this issue.

Mark Discusses Synthetics

"Fundamental Aspects of the Synthetic Rubber Problem" was the title of the talk given by Prof. Mark. He stated that recent progress in the chemistry of high polymers has established certain general relations between the molecular structure of long chain compounds and their technical properties, but that in order to characterize the molecular structure certain old methods had to be improved and new ones developed, such as the measurement of the osmotic pressure and the viscosity of highly diluted solutions, the determination of the sedimentation velocity in the ultra-centrifuge, the application of fractionated precipitation, and the use of X-rays for the determination of the orientation and crystallization in the solid state.

Prof. Mark then outlined the main features of the structure of a given sample and showed how these characteristics of a high polymeric material can be connected with technical properties such as elasticity, resilience, vulcanizability, and resistance to oxygen, light, etc. He used charts, graphs, slides and structural models throughout his talk to emphasize various theories discussed.

At a short business meeting which followed the usual good dinner, at which 262 were present, Chairman F. E. Traflet revealed that the membership had voted in favor of substituting a technical meeting for the annual outing this year. A hand vote called for by the chairman at the meeting further supported this decision. (EDITOR'S NOTE: The Executive Committee, meeting in New York on April 9, selected May 15 as the date for the meeting. Details concerning the program will be made available shortly).

The meeting concluded with the presentation of two sound films, "American Sea Power" and "Eyes of the Navy." These films traced the careful training an aircraft pilot receives at Navy base schools, life aboard naval vessels, and war maneuvers at sea.

Rubber Suit Proves Worth

According to the Norwegian master of a motor tanker recently sunk by torpedoes, his countrymen have been using a rubber suit that keeps seamen afloat, dry and warm when they are forced to abandon ship without a chance to use lifeboats. The suit, which is being made in this country, consists of a kapok-filled vest and a rubberized twill, one-piece overall, which covers the head as well as the entire body. When the drawstring on the suit is pulled tight the air remaining within the suit cushions the wearer against the impact of a high dive or fall into the water. Another advantage of the suit is that it can be donned within one minute. Per Aabel, a Norwegian lawyer, now in this country, was one of the designers of the suit.

Chicago Meets on May 1

The next meeting of the Chicago Group, Rubber Division, A.C.S., will be held at the Congress Hotel in Chicago on Friday, May 1. R. L. Sibley, of the Monsanto Chemical Co., will speak on "Rubber Reaction Products." The election of officers for the 1942-43 season will also be held.

SEVERAL TALKS HEARD BY LOS ANGELES RUBBER GROUP

Several excellent talks on a variety of subjects were heard by approximately 145 members and guests of the Los Angeles Group, Rubber Division, A.C.S., at a meeting held in the Mayfair Hotel, Los Angeles, Calif., on April 7.

Dr. Earl Cranston, head of the history and political science departments of Redlands University, who lived in the Orient for many years, gave an instructive talk on the current world situation and the prospects for the future. He predicted that America would win the war in the East and said that it was destined to play a larger role in world affairs than at any time in the past.

Talks on Perbunan were given by E. N. Cunningham and John A. Britton, both associated with the Chemical Products Department of Stanco Distributors, Inc. Mr. Britton, located in the New York office, was visiting Los Angeles. A brief address on Australia and his experiences in that country was given by Karl Dunkel, a member of the group, who recently returned from a two-year sojourn in Melbourne. In addition, Greig Strohm, of Pan American Airways, showed a colored motion picture of "The Land of the Incas."

During the business session, T. Kirk Hill (Kirkhill Rubber) reported the findings of a committee which has had under consideration the proposal that the group co-operate in employing a full-time executive to represent various plants in the Los Angeles area in contacting government agencies with reference to priorities and similar matters. The committee recommended that the group drop the matter permanently inasmuch as a move in this direction was being made by another organization. (EDITOR'S NOTE: The "other" organization referred to is the California Rubber Manufacturers Association.)

Special prizes distributed at the meeting included an Eversharp pen and pencil set donated by the National Standard Co. through L. A. Smith, which went to Virgil Lacey; a Remington-Rand electric shaver, given by Ed Royal, won by Gordon Boelter; and a set of miniature tires, donated by the J. R. Gardner Co., won by Jim Wright. Defense stamp books in three different amounts were offered as door prizes by the group itself. Table favors, consisting of mechanical trouser hangers, were donated by Martin, Hoyt and Milne, through the local representative, Monty Montgomery.

The next meeting of the group will be held at the Hotel Mayfair, Los Angeles, on May 5.

An Index to Volume 50 of RUBBER AGE will be found facing Page 92 of this issue.

MELLON INSTITUTE REPORTS RESULTS OF INVESTIGATIONS

Following its usual practice the Mellon Institute of Technology has publicized the results of various investigations conducted under fellowships for the fiscal year ended February 28, 1942. Of special interest to the rubber industry were the following:

Carbon Blacks as Adsorbents: The work of the Columbian Carbon Company's fellowship (W. J. Remington, incumbent) was concluded during the year by a study of the activation of colloidal carbons with the aim of investigating the possibilities of colloidal carbons for use in adsorption, either in their original form or after treatment. In general the findings revealed that colloidal carbons in their original powder state were not suitable for employment in the purification of water in the adsorption of vapors, but that a few possessed a very high capacity for the decolorization of sugar solutions.

Some of the carbon blacks, prepared in pellet form with a suitable binder and steam-activated, showed marked increases in their capacities for adsorbing vapors and for purifying water. This fellowship, incidentally, had a life of 15 years and its biography abounds in unexpected exploits. The Columbian Carbon Co. will later resume research in the Institute on a new program.

Gartex: The associated fellowship research on Gartex has been continued by K. J. Miller. Gartex is the processed filler for rubber, plastics, paints, and the like. Studies of this product in hard rubber compounds and synthetics have been particularly fruitful. The investigation of new surface treatments is an important phase of this work. (EDITOR'S NOTE: Gartex is now available commercially from Garco Products, Inc., Butler, Penna.).

Expansion of Rubber Program: The Firestone Tire & Rubber Company's fellowship, led by R. C. Briant, has been carrying on for about four years fundamental studies of underlying problems of the rubber industry. Because of the prime importance of rubber technology in the national emergency, the research is being increased through the employment of additional personnel. Firestone has collaborated with the fellowship of the Cotton Research Foundation in making practical trials of tire-cord developments.

Raolin Production and Applications: The Raolin fellowship has been establishing commercial production and looking after certain specialized commercial uses for the Raolin resins. In cooperation with the Binney & Smith Co. information has been acquired on solvents and plasticizers for chlorinated rubber.

During several preceding years the fellowship developed a composition for employment in the manufacture of coated paper for container closure linings and devoted considerable time to gaining a suitable method of application to ensure the production of a high grade material. During 1941 this process was carried to commercial application. The Raolin coating used for production of this specialty paper gives a film that is translucent, colorless, tasteless, odorless and non-toxic. It has been widely tested and has been found suitable for employment in closures on a wide variety of containers for pharmaceuticals, cosmetics, food products, beverages, and other packaged goods.

This coating is resistant to mineral and vegetable oils, aqueous acids and alkalies, alcohols, peroxides and oxidizing agents, aliphatic hydrocarbons, brines, and water. The moisture transmission rate of the film is unusually low. For water and water vapor the rate at 100° F. and 5% relative humidity is below 0.004 gram per sq. cm. per day. The finished product has been made available in bonded strip form or as punched liners.

A factory is operating under the Raolin Corp. patents. Early in October, however, defense requirements of chlorinated rubber had greatly exceeded domestic production and, as a result, chlorinated rubber was placed under priority control and the entire Raolin output has since been allocated according to government instructions. To assist in meeting the nation's needs, a substantial plant expansion program is under way. J. W. Raynolds, president of the Raolin Corp., is the holder of the fellowship.

In addition to the above reports, the Institute reported that the development over the past three years of a strong cotton tire cord of long flex-life and low susceptibility to heat and moisture for use in heavy-duty pneumatics culminated in the release by the Cotton Research Foundation of complete processing details to industry. A number of major companies have signed the very liberal agreement offered by the Foundation. This development was achieved under the multiple fellowship sponsored by the Foundation.

CONSERVATION OF RUBBER SHOWN IN TELEVISION BROADCASTS

The Columbia Broadcasting System, in cooperation with the United States Rubber Co., featured television broadcasts on March 13 and 20 to show civilians how to get the best possible service from the numerous rubber products used in the home and from their tires and tubes.

The broadcasts were part of a series designed to inform the public how best to conserve strategic and critical materials. The Consumer Durable Goods Section and the Bureau of Industrial Conservation of the War Production Board participated in the broadcasts.

In the first program, the public was shown how to wash and dry hot water bottles, bathing caps, feeding nipples, etc. The second portrayed proper inflation methods for tires and tubes and stressed the part played by rubber products in the war effort.

In the accompanying photograph, John P. "Jack" Coe, popular general manager of Naugatuck Chemical and vice-president of Dispersions Process, Inc., is shown in the process of being televised during the first broadcast.

A bulletin on the care and use of airbags and steambags has been issued by the Rubber Manufacturers Association, 444 Madison Ave., New York City. Copies are free for the asking.

FINANCIAL NEWS

Aetna Rubber Company

For 1941: Net operating profit of $1,350, which compares with a net loss of $34,529 in the previous year. This is the first profit reported by the company since 1928. Profit before idle plant expenses and depreciation amounted to $22,375, while the net after depreciation was $11,150, but an extraordinary interest expense item of $9,780 reduced the profit to the reported figure. Net sales amounted to $437,317, compared with $349,281 in 1940. Surplus at the year-end amounted to $10,972, after a loss of $67,737 on the sale of the company's Ashtabula plant.

Mansfield Tire & Rubber Co.

For 1941: Net income of $484,475, equal to $2.88 per share of common stock, which compares with a loss of $297,913 reported for the previous year. Expenditure of $463,363 for new machinery and equipment during the year to convert full production to defense purposes proved to be a good investment since it resulted in the company being awarded a substantial amount of defense business, according to George W. Stephens, president of the company.

Intercontinental Rubber Co.

For 1941: Net income of $370,233, after all charges, taxes and reserves, equal to 62c each on 596,004 capital common shares outstanding, which compares with $323,614, or 54c a share, in 1940. The consolidated balance sheet shows current assets of $1,569,429 as of December 31, 1941, and current liabilities of $461,372, against $1,402,812 and $266,479, respectively, last year.

Master Tire & Rubber Co.

For 1941: Net income of $37,480, after charges and taxes, which compares with $3,343 reported in the previous year. Net sales were $4,605,958 against $3,414,050. The balance sheet as of December 31, 1941, shows total current assets of $1,044,573 and total liabilities of $457,944, compared with $855,645 and $367,020, respectively, a year ago.

Columbian Carbon Company

For 1941: Net income of $3,529,159, after provision for Federal taxes, equal to $6.57 a share, which compares with $3,068,799, or $5.71 a share, reported for 1940. Sales amounted to $21,121,296, contrasted with $16,140,526 in the previous year. The company shipped 160,942,094 pounds of carbon black during 1941, largest in its history.

Anaconda Wire & Cable Co.

For 1941: Net profit of $2,507,476, after provision of $250,000 for contingencies, equal to $5.94 each on 421,981 shares, which compares with $1,717,468, or $4.07 a share, in the previous year. Provision for Federal income and excess profits taxes in 1941 totaled $6,200,000, in contrast with $950,000 in 1940.

Raybestos-Manhattan, Inc.

For 1941: Net income of $2,053,036, after provision of $4,562,597 for state and Federal income and excess profits taxes, equal to $3.27 per share, which compares with $1,696,926, or $2.70 a share, in 1940. Sales in 1941 amounted to $42,697,779 against $25,434,007 in the previous year.

L. H. Gilmer Company

For 1941: Net income of $225,077, equal to $2.72 each on 82,824 shares of common stock, which compares with $105,030, or $1.27 a share, reported for the previous year. Net sales in 1941 amounted to $2,654,855, compared with $1,506,771 in the year before.

American Cyanamid Company

For 1941: Net income of $6,766,292, equal after preferred dividend requirements to $2.42 a share on the common stock, which compares with $6,395,666, or $2.44 a share, reported for 1940. Provision for taxes of all kinds amounted to $13,993,915.

Lima Cord Sole & Heel Corp.

For 1941: Net income of $130,065, equal to $1.16 each on 111,689 shares of common stock, which compares with $42,502, or 38 cents a share in the previous year. Net sales for the year amounted to $1,205,041, compared with $670,730 in 1940.

American Wringer Company

For 1941: Net profit of $380,512, after provision of $243,121 for Federal and Canadian income and excess profits taxes, which compares with $261,225 in 1940. Net sales amounted to $5,108,547 against $3,811,680 in the previous year.

Garlock Packing Co.

For 1941: Net profit of $1,434,858, equal to $6.85 each on 209,250 shares, which compares with $1,132,516, or $5.41 a share, reported for the previous year.

Gibson Island Conferences

The conferences sponsored by the American Association for the Advancement of Science at Gibson Island for the past four years will be continued this summer. Ten conferences in all will be held, scheduled for the weeks of June 15 through August 24, excluding the week of August 10. The Conference on Organic High Molecular Weight Compounds will be held from July 6 to 10, inclusive. Papers scheduled for this conference, and their authors, follow:

Nature, Direction, and Magnitude of Forces between Molecules, J. C. Slater; *Interfacial Force Phenomena,* Irving Langmuir; *Experimental Aspects of Adhesion to Metals,* G. H. Young; *Structural Aspects of Adhesion and Cohesion,* Otto Beeck and H. Mark (two separate papers); *Distribution of Molecular Sizes in Organic Polymers,* J. G. McNally; *Condensation Polymerization,* P. J. Flory; *Theory of Vinyl Type Polymerization,* F. K. Schoenfeld.

Because of the growth of the conferences, the American Association for the Advancement of Science has purchased a property on Gibson Island and the conferences are now on a permanent basis. The purchase was made possible by substantial contributions from a number of companies whose laboratories have been represented at the conferences. These companies include the B. F. Goodrich Co., Barrett Co., Monsanto Chemical Co., Standard Oil Development Co., and the Norton Co. Dr. Neil E. Gordon, Central College, Fayette, Missouri, is director of the conferences.

New Serum to be Announced

Since his arrival from Germany eight years ago, Mr. Sam Baron has brought out several materials, including a binder and a softener and rubber substitute, which are being manufactured and used in various rubber plants. A new material, called a serum, is expected to be announced shortly which is said will effect an appreciable saving in crude rubber. Mr. Baron can be reached at the plant of the Elm City Rubber Co., Inc., New Haven, Conn.

American Hard Rubber Co.

For 1941: Net profit of $495,087, equal after dividends on the 8% preferred stock to $5.50 each on 65,503 common shares, which compares with $456,457, or $4.73 a common share, in the previous year.

National Rubber Machinery Co.

For 1941: Net income of $374,752, after provision of $175,746 for Federal income and excess profits taxes, equal to $2.43 each on 154,000 capital shares, which contrasts with a net loss of $52,115 reported for the year of 1940.

SYNTHETIC RUBBER COMPOUNDS DISCUSSED BY BALL AT QUEBEC

John M. Ball, associated with the R. T. Vanderbilt Co. for the past twenty years and editor of *Vanderbilt News* for the past year, and who left the service of that company last month to join the Division of Civilian Supply of the War Production Board, spoke on "Synthetic Rubber Compounds" at a meeting of the Quebec Rubber & Plastics Group, held at McGill University in Montreal on April 10. Since his arrangements to come to Montreal were made prior to his governmental appointment, he spoke to the group as a Vanderbilt representative.

Mr. Ball showed samples and photographs of seven different synthetic rubbers, both in the raw state and also after having been masticated for five minutes on a cold laboratory mill. A sample of one of the synthetics after having been plasticized and compounded, both uncured and cured, was also shown. Slides of a few compounds containing the synthetics, together with tensile properties, hardness and resistance to hot oil, were also shown.

To illustrate resilience, Mr. Ball bounced solid balls from a height of 2 feet onto a firm iron plate, with the percent of rebound being noted. This was done both at room temperature and at the temperature of boiling water. The resilience varied widely with the compounds and also with the temperature.

During the business session it was decided to hold a plastic meeting in May since the one scheduled in March had been cancelled due to the inability of the scheduled speaker to appear. Accordingly, a meeting will be held at McGill University on May 8 and the speaker will be A. E. Byrn of the Canadian General Electric Co., who will discuss plastics in general and the Glyptal Resins in particular.

Change Date of Meeting

The international meeting of the Buffalo Group, Rubber Division, A.C.S., to be held in Niagara Falls, Canada, in conjunction with the Ontario Rubber Group of the Canadian Chemical Association and the Quebec Rubber & Plastics Group, will be held on Thursday, April 30, instead of Friday, May 1, as heretofore announced. The meeting will be held in the General Brock Hotel. No speakers have yet been announced.

New Wood Flour Plant

The Wood Flour Products Corporation has been organized at Laconia, N. H., for the production of wood flour from 100% white pine in meshes from 20 to 100. Actual operations were expected to begin early in April. Karl Hamm is president of the company.

Life of Fish Nets

The life of fish nets can be extended considerably by a new chemical treatment utilizing a solution of chlorinated pale crepe rubber plasticized by dibutyl phthalate and containing a bactericide, according to reports from Vancouver, B. C. Strands treated in this manner retain the necessary flexibility, and show substantially increased life in sea water. Moreover, the treated strands are said to be easier to handle and clean and there is also less tendency for knots to slip.

Washington Appointments

John M. Ball, associated with the R. T. Vanderbilt Co. for the past twenty years, and editor of the *Vanderbilt News* for the past year, has joined the Division of Civilian Supply of the W.P.B.

Donald Wallace, until recently assistant director of the Price Division of the O.P.A., has been named assistant administrator of the newly-created Industrial Materials Division of that Office, in charge of rubber, metals, machinery, and automobiles and trucks.

"Vanderbilt News" Is Suspended

A notice appearing with the current March-April issue of the *Vanderbilt News*, technical house organ published by the R. T. Vanderbilt Co., announces that that journal will suspend publication for an "indeterminate period" and that the editor, John M. Ball, who has been associated with the company for more than 20 years, has accepted an appointment with the Division of Civilian Supply of the War Production Board. Results of the work accomplished in the Vanderbilt Laboratory will temporarily be printed or mimeographed in sheet form and distributed to those concerned.

Deodorized Industrial Naphthas

A new line of deodorized industrial naphthas has been introduced by the Anderson-Prichard Oil Corp., Oklahoma City, Okla. Under the deodorized treatment developed by the company residual odors or the polar compounds that give residual odors are either completely removed or removed to such a degree that they are not noticeable even before the naphtha is completely evaporated. Inquiries concerning these new naphthas may be directed to the general offices of the company or to either of its laboratories located at 3921 North Ravenswood Ave., Chicago, Ill., and 242 West 55th St., New York City, respectively.

LARGEST ANNUAL SALES VOLUME RECORDED BY INDUSTRY IN 1941

Although during the year there were imposed on rubber goods manufacturers increasingly strict regulations affecting supplies, sales and prices, 1941 saw the largest annual volume of production and sales ever experienced in this industry, according to the latest survey of the industry completed by Dun & Bradstreet, Inc. Consumption of crude rubber reached an estimated 800,000 tons, compared with 649,000 tons in 1940.

Production of tires, curtailed sharply at the close of the year by government order, amounted to 61,531,000 units, approximately the same number produced in 1940. Shipments, however, rose to 66,163,000 which was substantially higher than the 58,774,000 sold in 1940, although below the all-time peaks of the late 1920's.

The survey also indicates that the year of 1941 was one of relatively high earnings, an improvement of 31% in net profits over the 1940 level being reported by 17 manufacturers. War production, of course, accounts for a sharply increasing proportion of the industry's business.

Detroit to Hear Somerville

Dr. A. A. Somerville, of the R. T. Vanderbilt Co., New York, will be the principal speaker at the next meeting of the Detroit Rubber & Plastics Group, to be held at the Detroit-Leland Hotel in Detroit on Friday, May 8. He will speak on "Latest Dope on Synthetic Rubber as Related to Accelerators and Plasticizing and High Temperature Testing." The following officers were elected for 1942 at the last meeting of the group, held on February 27, as previously reported: *Chairman*, J. H. Doering (Ford Motor); *Vice-Chairman*, W. B. Hoey (Bakelite Corp.); *Secretary-Treasurer*, E. J. Kvet (Baldwin Rubber); *Counselor*, W. G. Nelson (U. S. Rubber); *Publicity Chairman*, E. F. Riesing (Firestone). Members of the Executive Committee, in addition to the above, are: F. Wehmer (Minnesota Mining), J. C. Dudley (Chrysler), J. R. Shroyer (Vanderbilt), J. Miller (Durez Plastic), W. M. Phillips (General Motors).

R. I. Rubber Club Has Meeting

A meeting of the Rhode Island Rubber Club was held on March 20 at the Narragansett Hotel in Providence, R. I. Prof. Alfred C. Neal, of the Economics Department of Brown University, gave a talk on "The Economic Impact of the War and the Post-War Outlook." A few door prizes were distributed to holders of lucky-number tickets through the courtesy of the American Zinc Sales Co., Continental Carbon Co., Monsanto Chemical Co., and Wishnick-Tumpeer, Inc. Approximately 65 members and guests attended the meeting.

LOS ANGELES NEWS

Fred Woerner, who was with the C. P. Hall Company for several years and more recently with the W. J. Voit Rubber Company, has taken a position as consulting engineer with the L. A. Standard Rubber Company, 1580 E. Slauson Avenue, Los Angeles.

Frank L. Shew, who has been in the chemical department of the W. J. Voit Rubber Company for some months, is now connected with the laboratory staff of the Grizzly Manufacturing Company, formerly the E. M. Smith Company, 637 S. Clarence Street, Los Angeles.

John A. Britton, manager, and E. N. Cunningham, technical sales representative, of the chemical products department of Stanco Distributors, Inc., spent a week in Los Angeles early in April. They were interested in presenting facts in reference to Perbunan, the company's synthetic rubber.

L. F. MacDonald, treasurer of the Los Angeles Rubber Group, and formerly connected with the B. F. Goodrich Company, is now connected with the engineering department of the California Ship Building Corporation at Wilmington, Calif.

The Sierra Rubber Company has completed and moved into a new building which gives the firm much more floor space and improved working conditions.

The Los Angeles Standard Rubber Company has completed modernization of its offices and painting of the exterior of the building at 1580 E. Slauson Avenue. Considerable new machinery has been added in the last few weeks, including a 48-inch mill, six new presses and other machines. The company is engaged mostly in defense work and synthetic rubber is used almost exclusively.

The company started in business a little over a year ago and has made rapid progress. The associates in the firm are Bob Wade, Carl Phipps, Charley Kuhn, and W. F. Sturdivant, all men well known in the rubber industry in Los Angeles.

Bill Stokes who has been sales manager for the Faulhaber Rubber Company for some time has retired from that position.

The Golden State Rubber Mills, Inc., 651 E. 61st Street, have completed installation of a laboratory with modern equipment. The increased use of synthetics has made the improvement necessary, according to Emmet S. Long, general manager. I. D. Blumenthal, president of the company, who spent several months in Los Angeles, has returned to Charlotte, N. C.

R. S. Pope, formerly personnel manager for Goodyear in Los Angeles and now personnel manager for the Goodyear Aircraft Corporation in Akron, has informed Los Angeles friends of the death of his wife on Monday, March 30. Mrs. Pope had been ill for some time.

James R. Gardner, proprietor of the J. R. Gardner Company, Inglewood, a rubber manufacturing company started in recent years, reports that business is on the increase. A great deal of the work is defense work, the plant being located in the immediate area of two or more large aircraft factories.

Leon L. Horchitz, ex-president of the Los Angeles Rubber Group, in charge of the sales division for industrial products for the B. F. Goodrich Company, is kept busy with an enlarged territory which takes in the San Francisco area as well as the state of Arizona.

W. S. Richardson, general sales manager of industrial products, and J. J. Newman, vice-president, of the B. F. Goodrich Company, were the chief speakers at a meeting of owners and managers of Goodrich product outlets as well as heads of other industrial companies in the Los Angeles area, held in the Ambassador Hotel, Los Angeles. About 1,000 were in attendance. The situation was thoroughly discussed. City officials were also invited and attended in large number. Mr. Richardson remained in the Los Angeles area for several days.

R. B. Stringfield, one of the organizers and the first president of the Los Angeles Rubber Group, a chemical engineer of prominence in southern California, has recovered from a severe attack of pneumonia which laid him on the shelf for a month and a half. Mr. Stringfield is now connected with the University of Southern California and is putting in most of his time in connection with coordination of defense training courses offered by the university in co-operation with other agencies. A course in plastics in industrial design, a 16-week course with classes meeting Monday evenings, is now being offered with Mr. Stringfield as instructor.

Arthur Cutler, formerly vice-president and general manager of Arrow Products, Inc., Boston, Massachusetts, has joined the staff of Western Insulated Wire, Inc. He was connected with the Boston firm for more than 20 years.

Karl Dunkel, well known Los Angeles rubber man, who went to Melbourne, Australia, two years ago to install and operate a reclaim plant for the Olympic Tyre and Rubber Company, a company owned by Frank Beaurepaire, Lord Mayor of Melbourne, returned to the United States and to Los Angeles on Tuesday, April 7. After the fall of the Malayan area and adjacent islands, Mr. Dunkel and family with many others were asked by the American consul to leave the war area. It took 24 days to make the trip to San Francisco and no accidents occurred en route. Before leaving America for Australia, Mr. Dunkel had been in the employ of the DuPont company at El Monte. He is enthusiastic about the spirit and character of the Australian people.

Ned Cadot, personnel manager at Goodyear, is leaving for Akron where he will take over the duties of directing the labor department. Ned transferred to California in May, 1941. His place in California has been taken by Tom Mick. Mr. Mick has served the company in Singapore, Ceylon, and in other distant points. He came to the company in 1926 as a member of The Flying Squadron.

"How to Get More Mileage from Your Tires and How to Keep Your Trucks Operating More Economically" is the title of a new 52-page booklet issued by the Firestone Tire & Rubber Co., Akron. The entire gamut of conservation is covered.

APPROVED BY RUBBER CHEMISTS

SOUTHEASTERN CLAY COMPANY, AIKEN, SOUTH CAROLINA

NAMES IN THE NEWS

B. J. LEMON, of the General Development Division of the U. S. Rubber Co., is now serving as a Lieutenant Commander in the Motor Transport Division of the Army Quartermaster Corps in Washington, D. C.

FRANK S. MACGREGOR, until recently director of the priorities division of E. I. du Pont de Nemours & Co., Wilmington, Delaware, has replaced MILTON KUTZ as assistant general manager of the R & H Chemicals Department of that company. The latter has been out for several months due to illness.

J. J. NEWMAN, vice-president of the B. F. Goodrich Co., has been elected a director of the Rubber Manufacturers Association to succeed A. B. NEWHALL, who now bears the title of Coordinator of Rubber in the war effort.

HARRY E. BLYTHE, tire sales manager of the Goodyear Tire & Rubber Co. since 1937, has been elected vice-president and general manager of the Goodyear Aircraft Corp. Other officers elected included RUSSELL DEYOUNG, vice-president in charge of manufacturing; KARL ARNSTEIN, vice-president in charge of engineering and design; and T. A. KNOWLES, sales manager.

EMMET C. THOMPSON, assistant general manager of the Grasselli Chemicals Department of E. I. du Pont de Nemours & Co., Wilmington, Delaware, has been named general manager of that department, succeeding EDWARD W. FURST, who retired on April 1. CLARK W. DAVIS has been named assistant general manager.

KENNETH VANDENBREE, associated with John Royle & Sons, Paterson, N. J., manufacturers of extruding and other machines, for a number of years, has been named director of sales for that company.

M. C. TEAGUE, of the New Products Department of the U. S. Rubber Co., New York City, is delivering a number of talks on the use of latex in wartime before various sections of the A.C.S. under the auspices of the Society. His itinerary this past month included talks given on April 6, 7, 8, 9 and 10 in and near Detroit.

HENRY P. PRYOR, a chemist employed in the South Norwalk, Conn., laboratories of the R. T. Vanderbilt Co., and a member of the New York Rubber Group, has entered the service as a lieutenant and is currently stationed with the 514th Coast Artillery, Battery G, at Camp Davis, Hollyridge, N. C.

W. H. "BILL" KING, formerly associated with the Pocono Co., which was taken over some time ago by National Automotive Fibres, Inc., has joined the General Cable Corp. and can be reached at the Perth Amboy, N. J., plant.

L. D. "LARRY" WALKER, formerly chief chemist of the Triangle Conduit & Cable Co., now located in New Brunswick, N. J., is currently associated with Herron & Meyer, 82 Beaver St., New York City, doing technical sales work, particularly on Gastex black.

HANS W. ALBU, formerly chief chemist of the American White Cross Laboratories, New Rochelle, N. Y., is now associated with Arno Adhesive Tapes, Inc., Division of the Scholl Mfg. Co., Inc., Michigan City, Indiana.

CLYDE SCHETTER, associated with the public relations department of the Goodyear Tire & Rubber Co. for the past 13 years, has enlisted in the U. S. Navy and has been commissioned a lieutenant. He served for a year as a U. S. Marine in 1919 before his superior officers discovered he was only 14 years old, whereupon he was discharged.

OSBORNE BEZANSON, general manager of the Texas Division of the Monsanto Chemical Co., was elected a vice-president of the company last month. The Texas Division has under its jurisdiction a plant for the manufacture of raw materials for synthetic rubber.

HOMER H. BASHORE, until recently employed by the U. S. Rubber Co. at its Providence, R. I., plant on the development of soles and heels and rubber conservation, has joined the Dee's Flexity Stain Co., of Lynn, Mass., as chief of development. The company makes a line of adhesives.

JOHN E. CASKEY, assistant general manager, Naugatuck Chemical Division, U. S. Rubber Co., has been named manager of the Pennsylvania Ordnance Works which will be operated by the company for the manufacture of TNT.

R. W. MANEY, factory personnel manager at the Gadsden, Alabama, plant of the Goodyear Tire & Rubber Co., has been named acting superintendent of that plant, replacing A. C. MICHAELS, general superintendent, who has been transferred to the Goodyear Aircraft Corp. In Akron, D. E. SHEAHAN has become superintendent of the Plant 1 and Plant 2 tire divisions and E. T. RUFFNER, formerly superintendent of the company's Java factory, superintendent of the spreader division.

Cable Joins Chemical Warfare

Captain D. E. Cable

Captain Donald E. Cable, technical librarian, General Laboratories, U. S. Rubber Co., Passaic, N. J., a member of the Chemical Warfare Reserve, has been called to active service and is stationed in Texas with the Dallas Chemical Warfare Procurement District. After spending a few years in the paper industry, Captain Cable joined U. S. Rubber in 1930 as assistant to the general manager of the Fibre Products Department at Cleveland and went to the Passaic laboratories in May, 1931. He compiled the *Annual Bibliographies of Rubber Literature* for the years 1935 to 1939, inclusive, which were published by RUBBER AGE.

G. W. MARSHALL, JR., formerly general manager of the industrial sales division of Raybestos-Manhattan, Inc., at Manheim, Penna., is now general manager of the company's National Defense Division, with headquarters at 1673 Columbia Road, Washington, D. C.

H. J. KROTO, executive vice-president and general merchandise manager of the Cambridge Rubber Co., Cambridge, Mass., has been named vice-president of the company's Canadian subsidiary, Cambridge Rubber, Ltd., of Montreal.

J. M. LINFORTH, subsidiary sales company vice-president of the Goodyear Tire & Rubber Co., has been elected a vice-president of the parent company, and is now in charge of government as well as manufacturer's sales. C. F. STONE, a former vice-president of the company, has been made a member of the executive and finance committee.

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CANADIAN NEWS

Four government-owned synthetic rubber plants, capable of producing 34,000 tons of Buna S a year, are proposed in the Canadian rubber program recently announced by Hon. C. D. Howe, Minister of Munitions and Supply.

Control of all operations will be in the hands of the Polymer Corporation, Ltd., a government concern, headed by Col. Arthur L. Bishop as president. Col. Bishop, who is president of the Consumers Gas Co. of Toronto, is a noted engineer. Directors, in addition to Col. Bishop, include W. R. Campbell (Ford Motor Co., Windsor), A. C. Guthrie (Simmons, Ltd., Montreal), G. C. Labine (El Dorado Mines, Toronto), D. W. Ambridge (Ontario Paper Co., Thorold). Headquarters for the new company will be maintained in Toronto.

EDITOR'S NOTE: Word has just been received that J. R. Nicholson, of Vancouver, has been named manager of the Polymer Corp. Mr. Nicholson has been associated with Canadian rubber control, serving as chairman of the Rubber Substitutes Advisory Committee and the Synthetic Rubber Technical Advisory Committee.

As announced in the previous issue, a plant for the production of butadiene will be located at Sarnia, Ontario. To date this is the only plant that has actually been announced although it is understood that engineering design work on other units is well under way.

The Wartime Industries Control Board, in an order issued by Alan H. Williamson, Controller of Supplies, has placed used tires and tubes and retreaded tires under strict control. A vehicle owner must turn in to the dealer a tire or tube of corresponding size before he can purchase a used, repaired, retreaded or recapped tire or a tube and he will receive no trade-in allowance of any kind.

The tire or tube that is turned in must be removed at the time of the purchase from a running wheel or spare and after the purchase has been completed the owner must not have in his possession — on his car, in his garage, or anywhere else — more than five tires and tubes. A "used" tire has been defined as one that has been run for more than 300 miles.

No used tire may lawfully be sold for more than 75% of the value of a new tire, according to Samuel Godfrey, Administrator of Used Goods.

To assist police in preventing tire thefts it has been made an offense to buy or sell tires from which the serial number has been removed unless a special permit has been issued by the Controller of Supplies. Penalty is a fine up to $5,000 or five years imprisonment or both.

Authority has been granted the Fairmont Company, Ltd., government-owned crude rubber agency, to purchase all rubber remaining in the hands of Canadian manufacturers who are unable to use it. This ruling was passed when it became apparent that some holders of rubber stocks would be forced out of business because of restrictions on the use of rubber. The government company may buy up sole crepe and crepe trimming from footwear manufacturers at prices not exceeding the fair cost to the manufacturers.

John A. Barber, formerly with the B. F. Goodrich Company of Canada, has been named representative in charge of the new sub-regional office of the Wartime Prices and Trade Board in Kitchener, Ontario. Until other sub-regional offices are opened in Galt and Guelph, the Kitchener office will also look after the territory assigned to the latter two cities.

Recent appointments in the war effort include the naming of R. V. Woffindin, president and general manager of A. G. Spalding and Brothers of Canada, Ltd., as chairman of the advisory committee to the sports goods administration of the Wartime Prices and Trade Board, and L. J. Falkenhagen, sales manager of Jos. Stokes Rubber Company, Ltd., to the plastics advisory committee.

The Granby, Quebec, Board of Trade is attempting to correct reports that six rubber companies in that area had closed and thrown 2,000 workers out of employment. Of four rubber plants in Granby and Actonvale, two have changed their production and have practically eliminated the use of rubber. The other two plants are operating on war business so successfully that only 70 people have been laid off by the factories involved.

Malcolm L. Douglas, associated with the Dominion Rubber Co. for many years before leaving the rubber industry in 1935 to become vice-president and general manager of the John B. Stetson Co. of Canada, Ltd., manufacturers of Stetson hats, was recently made president of the latter company. He acted as general sales manager for Dominion's tire division during his tenure with that concern.

The Ames Holden Tire & Rubber Co. has called $23,700 of its 7% first mortgage bonds for redemption on May 1 at 105 and accrued interest. The Ames Holden plant at Kitchener was acquired by Canadian Goodrich more than a decade ago.

Dunlop Tire and Rubber Goods Company, Ltd., in 1941 gained over the previous year in both operating and net profits. The preferred shares netted $5.59 a share compared with $4.45 for 1940 and regular dividends of $1.25 a share were paid.

Bank loans were repaid in full and the cash position of the company materially improved. Reserve against depreciation of inventory values established in 1940 was further increased to offset price increases. The company has applied to the Department of National Revenue to establish a standard rate of profit to be used for purposes of calculating the excess profits tax as it is claimed that the abnormally low level of earnings for the 1936-1939 base period imposes an unfair hardship. As the final decision has not been made on this appeal, the company has made provision for taxes at the maximum rate.

Although production of elastic webbing has been prohibited, Canadian Lastex, Ltd., Dunlop subsidiary, is trying to use its covering equipment in the manufacture of other materials for war needs. Although Canadian Lastex experienced a considerable increase in sales, higher costs resulted in reduced earnings, which were still sufficient, however, to meet all debenture and sinking fund requirements. As working capital was in excess of requirements, the subsidiary redeemed a further $44,000 of the $114,000 debentures held by the parent company.

For the year 1941, Dunlop had an operating profit of $931,240 compared with $568,495 for the previous year. Net profit was $184,415 compared with $146,584 for 1940. Surplus carried forward was $432,497 compared with $317,650.

E. M. Proctor, Canadian representative to the Bureau of Industrial Conservation in Washington, will head the new Scrap Rubber Division now being organized by the Department of Munition and Supplies. A campaign has been launched by the new division for the collection of 25,000 tons of scrap rubber during the year and the channeling of this scrap into the manufacture of war materials and essential civilian articles.

The division will take care of arrangements for the purchase of the scrap by the government and the payment by the government of all freight charges involved in transporting the scrap to Montreal where it will be reclaimed. It will also have control over the basic prices to be fixed for all scrap rubber goods sold for reclaim purposes.

Imports of crude rubber into Canada in January amounted only to 434,266 pounds compared with 14,093,037 for the same month in the previous year. Final figures on imports for the entire year of 1941 show that a total of 149,172,052 pounds of raw rubber were brought into the Dominion compared with 113,773,959 in 1940.

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ALKYD 17-B A permanently tacky, alkyd type resin emulsion containing 40% solids. When mixed in equal proportions with normal latex, the mixture for all practical adhesive purposes is indistinguishable from latex.

ALKYD 18 An alkyd type resin emulsion which is non-yellowing and non-oxidizing. Film is water-white and non-tacky. Preferred where slight oxidizing action may be considered harmful to rubber. Extender for latex in coating, combining and impregnating processes.

EMULSION 58-8 A series of emulsified elastomers containing up to 65% solids. Recommended for use as full latex replacements in impregnation and combining.

PIGMENT BASES Concentrated aqueous dispersions of pigments in resin bases, available in all shades and viscosities, suitable for spreading, spraying, etc.

Also Acrylic, Vinyl, Maleic, Phenolic, Hydrocarbon, Ethyl Cellulose, Cellulose Acetate and Nitrate emulsions and solutions for various applications.

Resin and Lacquer Emulsions have been finding an ever-widening use in many industries. They have proved invaluable in replacing other materials in adhesives, modifiers, binders and fillers, grease proofing, waterproofing, sizing, impregnating, coating, color dispersions and innumerable other uses.

In the Rubber Industry these emulsions are being used today as *Latex Modifiers* and *Complete Latex Replacements* to extend, thicken, stabilize, increase penetration, improve resistance to acids, oils and solvents, and to mechanical coagulation, etc.; *in Coatings* to produce adherent pigmented coatings and as intermediate coats for lacquer on rubberized cloth; in *Rubberizing* textiles; in *Latex Treated Papers* to increase strength and improve ageing; in *Adhesives*, for paper, for leather to cloth, and cloth to cloth.

These are just a few of the known applications in the rubber field. Undoubtedly in your own plant you will find many uses for these emulsions to improve your products and extend the supply of the vital materials, LATEX and RECLAIMS.

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OBITUARIES

Cedric S. Johnson

Cedric Seavey Johnson, manager of the Granby, Quebec, Canada, plant of the Stedfast Rubber Co. of Canada, Ltd., died suddenly at his home in Granby on March 21. He had suffered from heart trouble for some time but seemed to be in fairly good spirits just preceding his death.

Born in Granby on March 30, 1887, Mr. Johnson received his education in local public and high schools and then entered the employ of the Granby Rubber Co., Ltd. He spent a number of years with the former Stoughton Rubber Co., at Stoughton, Mass., and when Stedfast Rubber opened its factory in Granby he returned to that city as manager of the plant, a position he held until his death.

Mr. Johnson was a member of Yamaska Lodge, No. 12, A. F. & A. M., the Granby Branch of the Canadian Manufacturers Association, and the Granby Board of Trade. Funeral services were held on March 24, with interment in Pinewood Cemetery, Granby. His second wife survives.

A. Fred Sinclair

A. Fred Sinclair, president of the Sinclair-Collins Valve Co., of Akron, manufacturers of hydraulic control valves for rubber and plastic and other types of processing equipment, as well as of airplane control valves, died on March 15 at the age of 53 of a heart ailment. He had been in poor health for some time. Born in East Liverpool, Ohio, Mr. Sinclair spent all his life in northern Ohio, working for the General Eelctric Co., the Ohio Injector Co., and the Falls Machine Co., before entering the valve business in Akron in 1931. He organized the present company in 1937. Mr. Sinclair was a member of the Masonic order and of the First Presbyterian Church of Akron, where he served as deacon. He leaves a widow, two daughters, and a son.

Franklin B. Speakman

Franklin B. Speakman, special technical representative for the Goodyear Tire & Rubber Co., and one-time development manager at the company's Jackson, Mich., plant, died in a hospital in Mexico City, Mexico, on March 15 from complications caused by spinal meningitis. Mr. Speakman had been in the chemical divisions of the company since 1919, previous to which he had been on special service in steel mill work for the U. S. Army. He was a graduate of chemical engineering at Lehigh University. He leaves a widow.

George C. Worthington

George Cushing Worthington, former president of the Worthington Ball Co., Elyria, Ohio, died in a hospital at Middletown, Conn., on April 4 after a brief illness at the age of 73. Born in Cleveland, Ohio, Mr. Worthington attended Andover Academy and was graduated from the Sheffield Scientific School of Yale University in 1891. In addition to achieving recognition as a designer for golf balls, he was also co-designer of the controller for trolley cars and the modern type velocipede. He had also designed household utensils. At the time of his death, Mr. Worthington was a director of the Worthington Ball Co. and the Cleveland Quarries Co. A son survives.

Edwin J. Botimer

Edwin J. Botimer, manager of engineering efficiency for the Goodyear Tire & Rubber Co., and a well-known figure in Goodyear circles, died at his home, 870 Orlando Ave., Akron, Ohio, on March 11, the victim of a sudden heart attack. Mr. Botimer was a graduate of Wooster College where he received his B.S. degree. He served with the American forces abroad for 14 months during the last war. He joined Goodyear in 1923 as a member of the efficiency department and became manager of engineering efficiency several years ago. Mr. Botimer was a Mason. He leaves a widow and four daughters.

James F. Kiernan

James F. Kiernan, secretary of the Robert Badenhop Corporation, crude rubber dealer of New York City, died in Doctors Hospital in New York on April 4 at the age of 50. Born in New York City, Mr. Kiernan had been in the employ of the Badenhop concern for more than 18 years. He was a member of the New York Athletic Club. He leaves a widow and two daughters.

Clinton R. Blanchard

Clinton R. Blanchard, former president of W. H. Salisbury & Co., mechanical rubber goods manufacturers of Chicago, died at his home in Oak Park, Ill., on March 12, at the age of 90. He was born in Bridgewater, Penna., and lived in Oak Park for over 50 years. Two daughters survive.

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Illinois Tech Forms N. Y. Chapter

At a dinner meeting of alumni of the Armour Institute of Technology and of Lewis Institute, now merged into the Illinois Institute of Technology, of Chicago, held at the Chemists' Club in New York City on March 11, a New York alumni chapter was formed. The vital role played by engineering schools in training men to speed up America's war production and the need for research in the world of today were stressed in talks given by H. T. Heald, president of Armour Institute, and Harold Vagtborg, director of the Armour Research Foundation, an affiliated organization, respectively.

It was revealed that the Institute's building fund recently passed the million dollar mark. Among the contributors to the fund is Wishnick-Tumpeer, Inc., whose president, Robert I. Wishnick, is an Armour Institute alumnus. Mr. Wishnick and Mr. C. D. Dallas, president of Revere Copper & Brass, Inc., were the hosts at the dinner meeting. Among rubber technologists present were Paul E. Nelson, of the Ideal Roller & Mfg. Co., Long Island City, and Donald E. Cable, of U. S. Rubber, now serving with the Procurement Division of the Chemical Warfare Service in Dallas, Texas.

American Toy Fair Held

The Annual American Toy Fair, sponsored by the Toy Manufacturers of the U. S. A., was held at the Hotel McAlpin in New York City from March 9 to 21. Although several rubber toy manufacturers had exhibition rooms and had anticipated taking orders on an "if and when" basis, figuring on using reclaim in their composition, word was received just before the fair opened to the effect that a restriction order on reclaimed and scrap rubber was coming through from Washington. Accordingly, few orders were accepted for rubber toys and, in fact, a few manufacturers did not exhibit any products. Among rubber manufacturers with exhibition space in the McAlpin or in permanent New York showrooms were the following: Auburn Rubber Corp., Seiberling Latex Products Co.; Sun Rubber Co.; Latexture Products, Inc.; Barr Rubber Products Co.; Franklin Rubber Co.; and Martin Rubber Co.

Set A.S.T.M. Meeting Date

The 45th Annual Meeting of the American Society for Testing Materials will be held at the Chalfonte-Haddon Hall in Atlantic City, N. J., on June 22 to 26, inclusive. In addition to numerous technical papers reports of standing committees will be given. Two outstanding technical features of the meeting will be a Symposium on Radiography and a Discussion on Solvent Action of Water Vapor at High Temperature and Pressure.

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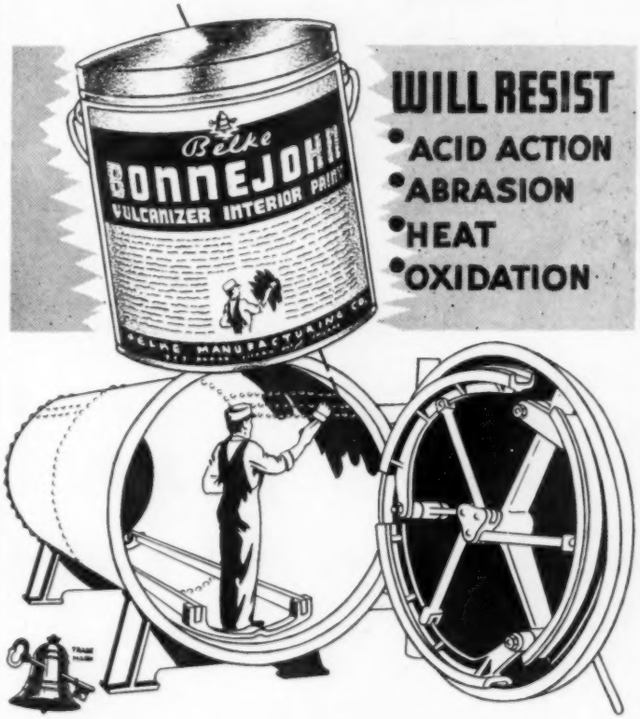

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Can be applied with a brush, spreads easily, has exceptional long lasting and adhesive qualities, seals perfectly requiring no preliminary preparation other than having surfaces clean before painting.

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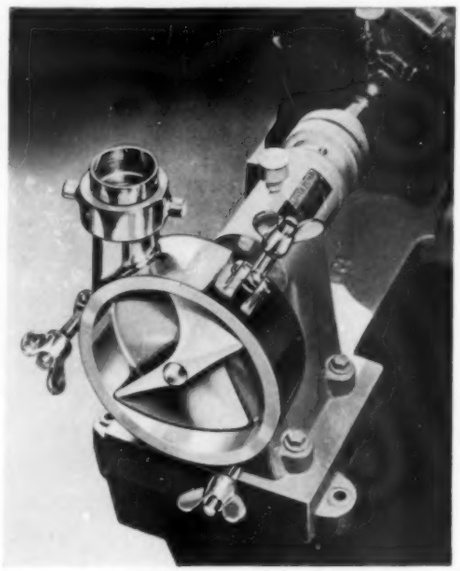
Tri-Clover Centrifugal Pump for Latex

Originally designed for handling milk, syrups, chemicals and foods with a minimum of agitation, the Tri-Clover Centrifugal Pump, manufactured by the Tri-Clover Machine Co., Kenosha, Wisconsin, has been found adaptable for use with latex. It will pump latex of 30% concentration or higher with no resultant ill effects, at temperatures from 70 to 100° F.

According to a report from a rubber manufacturer who first discovered the adaptability of this pump to



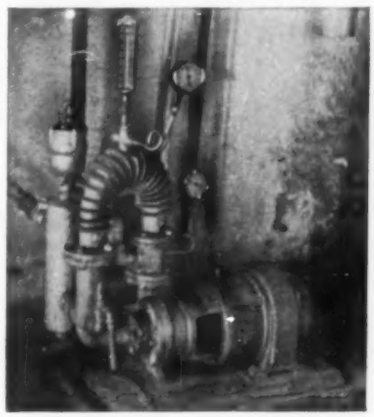
latex work, two features stood out as of great advantage, i.e., the ease of handling the latex without shock, and the ease of cleaning, which required only a few minutes time of flushing with water. This particular type of pump was originally designed for the easy cleaning required in the food industry, so it fits into this picture very readily. It appears at the same time that the pumping of latex and the pumping of milk have a characteristic in common. The whipping of either product is highly undesirable and is eliminated by this particular pump.

On the particular run discussed, the latex was pumped out of a 1200-gallon tank in 12 minutes, against one-hour and forty-five minutes previously consumed when using a gear pump of slightly less capacity rating. The maximum head was about 20 feet.

One of the important features in connection with the handling of latex is the prevention of "shock". Latex is composed of thousands of drops or globules carried in sacs or skin-like containers and the shock of most pumps breaks up these globules and "balls" or coagulates the latex. This in turn gums up the pump's impellers and makes a mess which is almost impossible to clean out and, also, slows down the pumping efficiency. It was the opinion of the engineer who conducted the test that this pump would lend itself ideally to dispersions of synthetic rubber.

High-Pressure Condensate Return System

Although applications of the Cochrane-Becker high-presure condensate return system, manufactured by the Cochrane Corporation, Philadelphia, Penna., are said to result in impressive savings in many processing operations where quick heating is necessary, the sav-



ings accruing from the use of such a system in the plant of the Pierce-Roberts Rubber Co., at Trenton, N. J., are reported by the company to be particularly tangible.

In the Pierce-Roberts plant, 32 vulcanizing presses are in constant use in the manufacture of gaskets, washers and miscellaneous mechanical goods. Steam is supplied the presses at 120 lb. to 125 lb. per square inch. The condensate return system evacuates the molding presses at 85 lb. per square inch. Previously, the returning condensate flashed in an open hot-well was in a large measure wasted, and the heat from the 5 lb. exhaust of a compressor engine was completely wasted to atmosphere. Now the high-pressure condensate is returned direct to the boiler at a temperature approximating 325° and the 5 lb. compressor exhaust is completely utilized in heating makeup.

The net results of the installation include fewer rejects with increased production and more accurate timing of the cure period, plus an estimated 28% fuel savings, the latter due in part to the better heat balance made possible by use of the previously-wasted compressor exhaust.

Midget Hot Liquid Pump

Eastern Engineering Co., 45 Fox St., New Haven, Conn., has introduced a newly designed and engineered Midget Hot Liquid Pump, said to be unique in its field. Known as Model EH it is compact in size and construction while its design makes it suitable for handling hot liquids up to 500° F. It may be used in industrial, pilot plant, laboratory and experimental applications where thin liquids at temperatures up to 500° F. are to be handled. Of the centrifugal type, the new pump is 12 inches long by 4 inches wide by 4½ inches high. It weighs 7 pounds and uses a 1/20 h.p. Universal fan-cooled motor. The stuffing box is accurately adjustable by means of an easily accessible adjustment ring.

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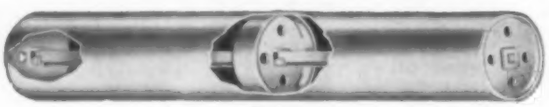

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REVIEWS

BOOKS, BOOKLETS, CATALOGS, Etc.

Insulation of Electrical Apparatus. By Douglas F. Miner. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. 6 x 9 in. 452 pp. $5.00.

Although not encyclopedic in scope, this book covers several important phases of the problems of dielectrics. It includes a resumé of the essential concepts of the nature and behavior of dielectrics, a description and comparison of insulating materials, a description of the practices in application of insulation to the major types of electric power apparatus, and a discussion of testing methods and equipment. Tables and curves showing properties of certain classes of insulation are given in the appendixes.

Any discussion of insulation must include reference to natural and synthetic rubber, and this book is no exception. Insulating properties of rubber and gutta-percha, as well as of neoprene, Thiokol, Buna and Koroseal, are briefly discussed in a section devoted to "Lastics." In justifying the small amount of space given to these materials the author points out that because the range of properties obtained in them is so astounding that an attempt to describe rubber as a single material would be useless.

The book has 18 chapters, is profusely illustrated, and contains a complete subject index. In addition to the appendixes already mentioned, there is another exclusively devoted to plastic materials, giving in each case the trade or brand name of the plastic, its type and its manufacturer. The book should prove of special value to the student or engineer seeking a working knowledge of insulation.

•

Treatise on Physical Chemistry. Vol. 1. Atomistics and Thermodynamics. Edited by Hugh S. Taylor and Samuel Glasstone. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. 6¼ x 9¼ in. 673 pp. $7.50.

This is the first of five volumes of the new third edition of the "Treatise on Physical Chemistry," which is being entirely revised and rewritten. This first volume is devoted to atomistics and thermodynamics. Subsequent volumes, to be issued at intervals of several months, will be devoted to states of matter, chemical equilibrium, chemical kinetics, and molecular structure, in that order. Incidentally, if all five volumes are ordered now, a special price of $6.50 per volume applies.

The complete treatise will cover the full range of modern physical chemistry. Following the previous arrangement, the treatise will be a cooperative effort, with specific subjects contributed by outstanding chemists associated with the particular subject. The present volume consists of four chapters, as follows: The Atomic Concept of Matter; Quantum Theory of Atomic Spectra and Atomic Structure; The First and Second Laws of Thermodynamics; The Third Law of Thermodynamics and Statistical Mechanics. Values of physical constants are given in an appendix. A complete subject index is included.

•

The Reclamation of Rubber. Naval Stores Dept., Hercules Powder Co., Inc., Wilmington, Delaware. 8½ x 11 in. 4 pp.

The various solvents and plasticizers made by the company for use in the reclaiming of rubber are described in this folder, as are two or three additional products which find application in the compounding of reclaim. Typical analyses of Tarol, Solvenol No. 1, Vinsol Resin and Staybelite are given. Brief mention of reclaiming processes is also made.

Occupations in Rubber. By Charles W. Ufford. Published by Science Research Associates, 1700 So. Prairie Ave., Chicago, Ill. 6 x 9 in. 48 pp. 50c.

One of a series of studies on occupational possibilities offered by various American industries, this booklet is devoted to the billion dollar-a-year rubber industry. It begins with a brief description of rubber's historical background and then describes rubber workers and their jobs. This is followed by a chapter devoted to suggestions on how to get a job in the industry. Subsequent chapters discuss the industry's accident and illness rate, wages and hours, opportunities for advancement, and the potential future. The author, now associated with Barrington Associates, Inc., as personnel management consultant, was for many years personnel manager of Ohio Rubber, and at one time served as secretary of the Rubber Section of the National Safety Council.

•

1942 Packaging Catalog. Published by the Packaging Catalog Corp., 122 East 42nd St., New York, N. Y. 8¾ x 11½ in. 642 pp. $5.00.

The latest edition of this packaging "bible" is classified into 17 sections, the whole being divided into 128 separate articles covering every known phase of the packaging art, each written, edited and sifted by an acknowledged expert. There are six new charts which provide vital data on every important angle of packaging, including design, properties of plastic sheeting, molded and cast plastics, and adhesives and labeling difficulties. The chart showing properties of wrapping materials includes data on rubber base products, such as Pliofilm. A brief description of rubber hydrochloride sheets also appears in the text.

•

Story of the Airship (Non-Rigid). By Hugh Allen. Published by the Goodyear Tire & Rubber Co., Akron, Ohio. 6 x 9 in. 74 pp. $1.00.

This book is actually a study of one of America's lesser known defense weapons—the non-rigid airship, sometimes called a dirigible but more often referred to as a blimp. Not only is the histoy of this type of craft described from the beginning to date, but its theoretical use in locating and helping to destroy Axis submarines cruising in American waters is excellently portrayed. That this theory will soon become actual fact seems foreordained. The book, written in Mr. Allen's inimitable style, has 9 chapters, gives references and includes an index.

•

Phillips Hydrocarbons. (Bulletin 96). Special Products Division, Phillips Petroleum Co., Bartlesville, Oklahoma. 5½ x 8½ in. 64 pp.

Edited in the form of a reference manual, this booklet presents in condensed form information on the properties, uses (other than as fuel), and specifications of the special hydrocarbon products developed by the company. Pure, technical and commercial hydrocarbons are described, including paraffins, cycloparaffins, olefins, diolefins, aromatics, and petroleum ethers and naphthas. Several tables of physical properties are given. A price schedule accompanies the booklet.

•

The Nitroparaffins. Commercial Solvents Corporation, 17 East 42nd St., New York, N. Y. 8½ x 11 in. 40 pp.

This booklet describes the Nitroparaffins and a number of useful derivatives, much of the information being published for the first time. An important part of the book is devoted to the applications of the 22 compounds now available. These include the use of nitrohydroxy derivatives as heat sensitizers for latex and of chloronitroparaffins as anti-gelling agents for rubber cements. The Nitroparaffins also find use as solvents for synthetic rubber and in the manufacture of rubber chemicals. In the sections on synthesis, over 80 typical reactions are described.

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By Royce J. Noble, Ph.D.
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By Frederick Marchionna
Bibliography of latex patents and literature to June, 1932. Price: $15.00

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Bibliography of latex patents and literature from June, 1932 to January, 1937; rubber derivatives to January, 1937. Price: $20.00
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REVIEWS (CONT'D)

The Wreckord. Travelers Insurance Co., Hartford, Conn. 6 x 9 in. 36 pp.

This booklet is the twelfth in a series issued annually by the Travelers Insurance Co. giving street and highway accident data. It presents a comprehensive analysis of the facts about accidents in which 40,000 persons were killed and almost a million and a half were injured in 1941, both totals being the highest in the history of the automobile.

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RATES: Five cents per word, minimum charge $2.00, except POSITIONS WANTED, $1.00 for 40 words or less, extra three cents per word. All classified advertisements payable in advance. Address replies to box numbers care of RUBBER AGE, 250 West 57th St., New York.

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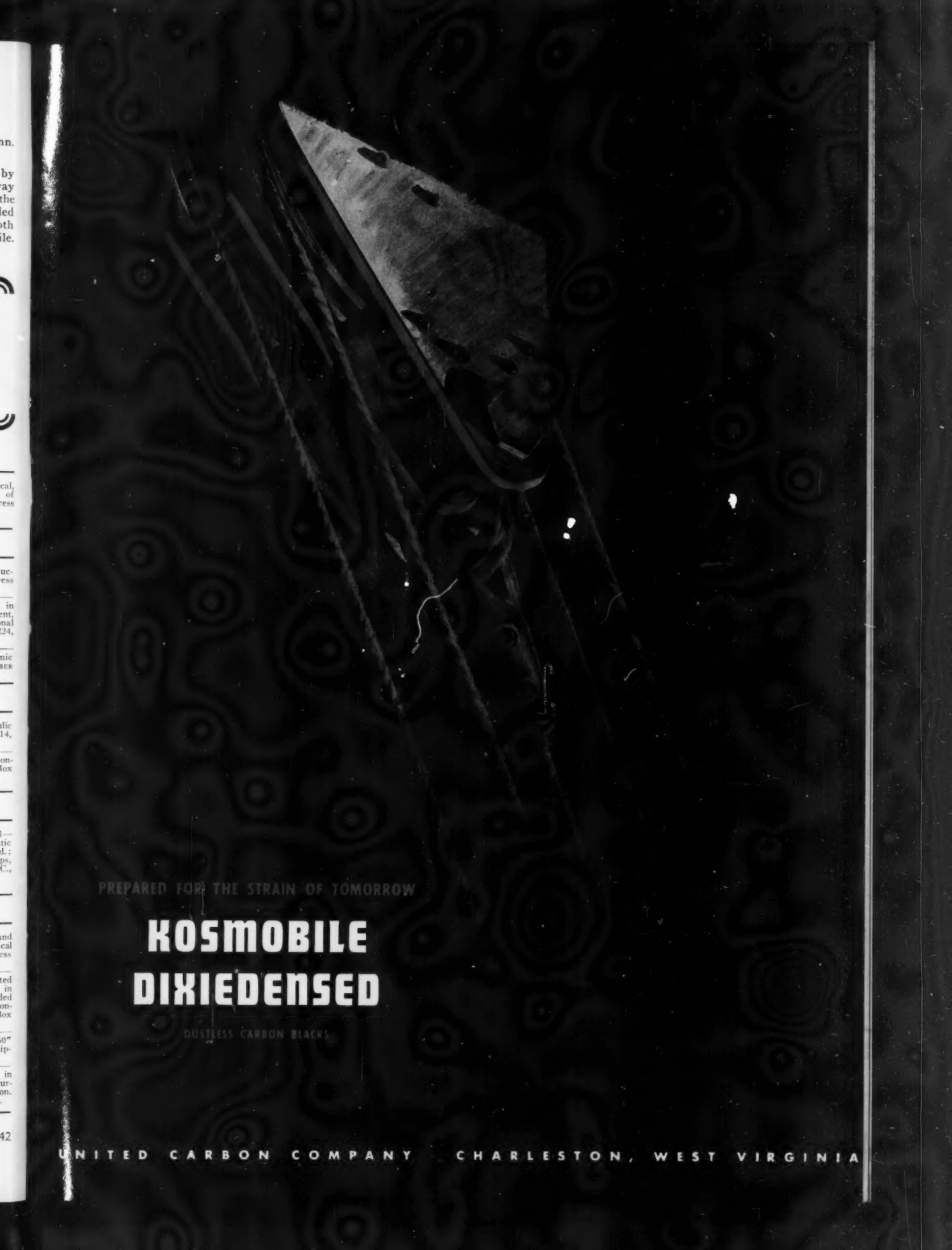
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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, APRIL 13, 1942

Crude Rubber

THE past month witnessed the cessation of trading of any kind on the Commodity Exchange. On March 11 the Board of Governors of the Exchange accepted the report of a special committee previously appointed to investigate liquidation of remaining open rubber contracts. These contracts were liquidated at 22.50 cents per pound, the price fixed by the Rubber Reserve Co. for Ribbed Smoked Sheet No. 1. There remained only 27 contracts to be liquidated.

Dealers have turned their attention whereever possible to Latin American markets. However, reports from those countries regarding trades in rubber are none too encouraging. These reports, plus the probability that the Rubber Reserve Co. will soon act to put such rubber under its direct control, have kept many importers from making actual contracts. In addition, Brazil has named the Bank of Brazil as the sole buyer and seller of rubber in that country, while similar action has been taken in one or two of the other Latin American countries.

Dealers are very much interested in the progress being made to secure rubber from sources other than *Hevea brasiliensis*. Special attention was paid to the report by the Forest Service of the Department of Agriculture concerning the rapid steps taken under the provisions of the guayule bill which recently became law. According to this report, more than 850 acres of field planting were completed within the first week in April and investigations have already been started looking to the establishment of test plots in various areas of the southwest. Mexico, too, is being considered.

Some interest was also expressed in the possibilities of cultivating *Kok-Sagyz* in the United States. Testimony recently presented before the House of Representatives would indicate that this rubber-bearing plant could be planted and grown in almost every state in the country. While there are conflicting claims regarding the yield per acre which can be expected from this plant, the Department of Agriculture is known to be investigating the possibilities. An urgent request has been sent to Russia, where the plant thrives, for sufficient seedlings to conduct a large-scale experiment.

Current quotations, including those fixed by the Rubber Reserve Co., follow:

As of April 13

Fixed Government Prices

Plantations—

Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.22½
No. 2	—	@	.22¼
No. 3	—	@	.22
No. 4	—	@	.21¾
Thin Latex Crepe	—	@	.23 5/16
Thick Latex Crepe	—	@	.23 5/16
Brown Crepe, No. 1	—	@	.21 5/16
Brown Crepe, No. 2	—	@	.21 5/16
Amber Crepe, No. 2	—	@	.21 3/8
Amber Crepe, No. 3	—	@	.21 1/16
Brown Crepe, Rolled	—	@	.17 1/16

Latex—

Normal, carload lots, tanks	—	@	.2595
Normal, carload lots, drums	—	@	.2825
Conc., carload lots, tanks	—	@	.2765
Conc., carload lots, drums	—	@	.2950

Outside Market Prices

Paras—

Up-River, fine	—	@	—
Acre Bolivian, fine	—	@	—

Balata—

Brazilian block	—	@	—

Scrap Rubber

Collections of scrap rubber continue light due to the reluctance of motorists to discard their worn tires and tubes. The situation has reached a point where the W.P.B. has enlisted the services of the W.P.A. to collect scrap rubber (as well as metal) by truck from farms in outlying districts. Dealers have been urged to turn over their stock of scrap every 60 days or so in order to keep the supply flowing smoothly. Most dealers are believed to be adhering to this request and in some quarters increased supplies are looked for in the early future. It seems evident that if reclaimers are to operate at a capacity of some 350,000 tons a year the cooperation of the government may be required. Prices shown below are ceiling prices:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	18.00
Beadless passenger tires	ton	24.00
Passenger S.A.G.	ton	18.50
Mixed truck tires	ton	18.00
Beadless truck tires	ton	24.00
No. 1 truck S.A.G.	ton	16.50
No. 2 truck S.A.G.	ton	16.50
No. 1 passenger peelings	ton	47.50
No. 2 passenger peelings	ton	30.00
No. 3 passenger peelings	ton	27.50
No. 1 truck peelings	ton	47.50
No. 1A truck peelings	ton	50.00
No. 2 truck peelings	ton	30.00
No. 3 truck peelings	ton	27.50
No. 1 light colored carcass	ton	52.50
No. 2 light colored carcass	ton	50.00
Gray carcass	ton	47.50
No. 2 passenger tubes	lb.	.07¾
No. 2 passenger tubes, lt. col.	lb.	.08¼
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06¾
Mixed passenger tubes	lb.	.06¾
No. 2 truck tubes	lb.	.07½
Red truck tubes	lb.	.07¼
Black truck tubes	lb.	.05¼
Two-toned black-gold tubes	lb.	.06¾
Two-toned red-black tubes	lb.	.06½

Tire Fabrics

The situation in the tire fabric field remains unchanged, with practically no demand for such fabrics. Consequently, prices are nominal and in many quarters are not even being quoted. The prices shown below are those which were in force on or about January 15.

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb.	.43½ @	.44
Peeler, carded, 23/4/3	lb.	.44½ @	.45
Peeler, carded, 15/3/3	lb.	.41½ @	.42
Peeler, carded, 15/4/2	lb.	.41½ @	.42
Peeler, carded, 13/3/3	lb.	.40½ @	.41
CHAFERS			
Carded, American, 1 1/16"	lb.	.43½ @	.44
Carded, American, 1"	lb.	.39½ @	.48

Sheetings

48x40	36 in.	5.50	lb.	— @	7.728
40x40	36 in.	6.15	lb.	— @	6.911
40x36	36 in.	6.50	lb.	— @	6.539
48x48	40 in.	2.50	lb.	— @	16.000
48x48	40 in.	2.85	lb.	— @	14.035
56x60	40 in.	3.60	lb.	— @	11.806
48x44	40 in.	3.75	lb.	— @	10.932

Note: These are ceiling prices, and will remain as quoted as long as cotton is in the price range of 19.92 to 20.35 on coarse goods and 19.99 to 20.48 on fine goods.

Cotton

The price of spot cotton has swung in a 122 point range since our last report, high for the period being 21.39 on April 9 and low 20.17 on March 16. The cotton trade was in a state of near-apathy in mid-March, with the result that prices moved in a very narrow range. Trading incentive seemed to be entirely lacking and the market was exceedingly dull. A sudden surge of trade buying developed on March 24, however, and the price rose from 20.31 to 20.64. Thereafter the price moved steadily upward, encouraged by government orders to mills and the late start of crops due to unfavorable weather conditions. Liquidation in the past few days has caused the price to fall off from the 12-year high of 21.39 on April 9 to 21.14 today (April 13). Domestic cotton consumption, which reached a new high daily rate in February, is expected to advance to still higher levels in the months immediately ahead, according to the Bureau of Agricultural Economics. Consumption for the season may reach 11,500,000 bales. Quotations for middling uplands on the Exchange follow:

	Mar. 9	April 13		
	Close	High	Low	Close
May	....	19.51	19.42	19.47
July	18.57	19.63	19.54	19.60
October	18.63	19.80	19.72	19.76

Reclaimed Rubber

Demand for practically all kinds of reclaim in the past thirty days is said to have exceeded actual amounts available. Recognizing this situation, the W.P.B. issued an amendment to the supplementary order covering the sale and use of rubber (M-15-b) placing strict control on the sale and use of scrap and reclaim. Executives of the Rubber Branch of W.P.B. have estimated reclaim capacity at about 350,000 tons a year and stressed the point that this rate could not be indefinitely continued, especially if supplies of scrap are not made more freely available. Reclaimers continue to expand their production facilities wherever possible and are cooperating wholeheartedly in the war effort. Prices shown below, for carload and less than carload shipments, are ceiling prices:

Shoe

Unwashed	lb.	.07 @	.07¼

Tube

Black Tube	lb.	.11¼ @	.11½
Red Tube	lb.	.12 @	.12¼

Tires

Black (acid process)	lb.	.07½ @	.07¾
Black, selected tires	lb.	.06½ @	.06¾
Truck, Heavy Gravity	lb.	.08½ @	.08¾

Miscellaneous

Mechanical blends	lb.	.04½ @	.05½
White	lb.	.13 @	.13¼

Ducks

Enameling (single filling)	lb.	.44 @	.45
Belting and Hose	lb.	— @	.36½
Single filling, A grade	lb.	.20 @	.21
Double filling, A grade	lb.	— @	.21½

CHEMICAL MARKETS

New York, Apr. 13, 1942
All Prices F.O.B. Works

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.28 @	.33
A-10	lb.	.36 @	.42
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.60 @	.70
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.45 @	.50
Beutene	lb.	.60 @	.65
Butyl Zimate	lb.	— @	1.15
Captax	lb.	.40 @	.45
Crylene	lb.	.40 @	.47
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.40 @	.47
Ethyl Zimate	lb.	— @	1.15
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.31 @	—
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.13 @	—
Witco	lb.	.15 @	—
Methyl Tuads	lb.	— @	1.55
Methyl Zimate	lb.	— @	1.25
Monex	lb.	— @	1.55
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	— @	1.65
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	1.55 @	1.70
Rotax	lb.	.50 @	.55
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.14 @	.16
Thiocarbanilid, drums	lb.	.28 @	.33
Thiurad	lb.	— @	1.55
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Ultra	lb.	1.25 @	1.75
Ureka	lb.	.50 @	.57
Blend B	lb.	.50 @	.57
Blend C	lb.	.48 @	.55
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Next Column)

Blues [b]			
Prussian	lb.	.36 @	—
Ultramarine	lb.	.16 @	.27
Browns [b]			
Mapico	lb.	.11 @	—
Umber, Turkey	lb.	.04¼ @	.05⅞
Greens [b]			
Chrome	lb.	— @	.25
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	— @	—
sulfur, free	lb.	— @	—
Indian	lb.	.08¾ @	—
Domestic (Maroon)	lb.	.11 @	—
Mapico	lb.	.09¼ @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red	lb.	.09¼ @	—
Whites			
Cryptone No. 19	lb.	.05¼ @	.05½
Cryptone CB No. 21	lb.	.05¼ @	.05½
Cryptone ZS-86	lb.	.07¾ @	.08
Cryptone ZS-230	lb.	.07¾ @	.08
Cryptone ZS-800	lb.	.07¾ @	.08
Lithopone:			
Albalith	lb.	.0385 @	.0410
Azolith	lb.	.0385 @	.0410
Ray-bar	lb.	.05½ @	.05¾
Ray-cal	lb.	.05½ @	.05¾
Rayox	lb.	.14½ @	.15¼
Titanox A	lb.	.13½ @	.13¾
Titanox B	lb.	.05½ @	.05¾
Titanox C	lb.	.05¼ @	.05½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06½ @	.06¾
Anaconda, lead free	lb.	.06½ @	.06¾
Horsehead Lead Free Brand:			
Special—3	lb.	.06½ @	.06¾
XX Red—4	lb.	.06½ @	.06¾
XX Red—72	lb.	.06½ @	.06¾
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06½ @	.06¾
green label	lb.	.06½ @	.06¾
red label	lb.	.06½ @	.06¾
U. S. P.—7, bbls.	lb.	.09¼ @	.09¾

[a] Price Ceilings.
[b] Price Suggestions or Agreements.

Zinc Oxide—French Process:			
Florence White Seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows [b]			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	— @	.50
Mapico	lb.	.06¾ @	—

BLACKS
(In bags, carload lots)

Aerfloted Arrow		.0355 @	—
Certified		.0355 @	—
Certified Spheron		.0355 @	—
Continental		.0355 @	—
Disperso		.0355 @	—
Dixiedensed		.0355 @	—
Dixiedensed 66		.0355 @	—
Excello		.0355 @	—
Furnex		.03½ @	.06
Furnex Beads		.03½ @	.06
Gastex		.03½ @	.06
Kosmobile		.0355 @	—
Kosmobile 66		.0355 @	—
Kosmos-Dixie 20	lb.	.03½ @	.06
Micronex (Amarillo)		.0355 @	—
Micronex Beads (Amarillo)		.0355 @	—
Pelletex		.03½ @	.06
P-33		.0475 @	—
Shell Carbon (Del. Midwest)		.025 @	—
Supreme		.0355 @	—
Thermax		.0225 @	—
Wyex		.0355 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85	@24.50
Asbestine	ton	16.50	@20.00
Barium carbonate (98-100%)	ton	47.00	@49.00
Barytes	ton	25.35	@36.00
Bentonite	ton	11.00	@16.00
Blanc fixe, dry	ton	60.00	@67.50
Calcene	ton	37.50	@43.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.00	@60.00
heavy	ton	45.00	@55.00
Clay, Aerfloted, Suprex	ton	10.00	@22.00
Crown (f.o.b. plant)	ton	10.00	@ —
Dixie	ton	11.00	@23.50
Langford	ton	—	@ 8.50
McNamee	ton	10.00	@22.50
Par	ton	—	@11.00
Witco	ton	10.00	@ —
Cotton Flock (Dark)	lb.	.10½ @	.13
Kalite No. 1	ton	26.00	@52.00
Kalite No. 3	ton	36.00	@62.00
Kalvan	ton	100.00	@126.00
Magnesium carbonate	lb.	.06¼ @	—
Mica	ton	35.00	@44.00
Mineralite	ton	—	@30.00
Pyrax A	ton	7.50	@20.00
Rottenstone (powd. Dom.)	ton	25.50	@37.50
Rubberol	lb.	.16 @	.16½
Silene (calcium silicate)	lb.	.04 @	.045
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00	@25.00
Whiting, commercial	ton	16.00	@26.00
Columbia Filler	ton	9.00	@14.00
Witco	ton	6.00 @	—
Wood Flour (100 mesh)	ton	30.00	@32.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	—
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	— @	—
Hard Hydrocarbon	ton	25.00	@42.00
Parmr, solid	ton	— @	—
Pioneer, MR, solid	ton	— @	—

MISCELLANEOUS

Aromatics—Rodo #0	lb.	4.00 @	4.50
Rodo #10	lb.	5.00 @	5.50
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors	lb.	4.50 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.39
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sponge Paste	lb.	— @	.18
Sunproof	lb.	.23 @	.28
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61
Ty-Ply R (and S)	gal.	6.75 @	8.75
Unicel (blowing agent)	lb.	.50 @	—

SOFTENERS

Acids			
Acetic, 28%, bbls. [a]	100 lb.	3.38 @	3.63
Nitric, 36 degrees	cwt.	5.00 @	—
Acids, Fatty			
Laurex	lb.	.15 @	.17½
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.10 @	.11
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10 @	—

Alkalies			
Caustic Soda, 76%	cwt.	2.70 @	5.70
Soda Ash, 58%	cwt.	1.15 @	2.98
Oils			
Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.12 @	.12½
Para-Flux	gal.	.08½ @	.18
Para-Lube	lb.	.425 @	.48
Petrolatum, amber [b]	lb.	.03½ @	.04½
Pigmentaroil, tank cars	gal.	.20½ @	—
in drums	gal.	.29 @	.30
Pine, steam distilled	gal.	1.20 @	—
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol	lb.	.13½ @	.14
Rubtack	lb.	.10 @	—
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	— @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.06 @	.06½
coal tar	ton	19.00	@22.00
hardwood	ton	16.00	@22.50
pine, 200 lb. gr. wt. bbl.		6.00 @	6.50
Pigmentar, tank cars	gal.	.20½ @	—
in drums	gal.	.29 @	.30
Retort Pine Tar, drums	gal.	.29 @	.30
Solvents			
Acetone, pure [a]	lb.	.07 @	.173
Benzene, 90%, tank car	gal.	.14 @	—
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.25
Carbon, bisulfide	lb.	.05 @	.08½
Carbon tetrachloride	gal.	.73 @	1.27
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.48 @	.50
Ethylene dichloride	lb.	.07½ @	.08½
Plastogen	lb.	.07¾ @	.12
Reogen (drums)	lb.	.11½ @	.15
Rub-Sol	gal.	.09½ @	—
Trichlorethylene	lb.	.08 @	.09½
Turpentine, spirits	gal.	.82 @	.86
dest. dist., drums	gal.	.60 @	.65
Waxes			
Beeswax, white [b]	lb.	.61 @	—
Carnauba, yellow [b]	lb.	.86 @	.88
Ceresin, white, dom.	lb.	.13½ @	.15
Montan, crude	lb.	.45 @	.46
Paraffin [a]			
Yellow crude scale, 124/126	lb.	.04¼ @	—
Refined, 123/125	lb.	.05¼ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	2.00 @	2.15
Gel	lb.	.57 @	.59
Hipar	lb.	.65 @	.67
Powder	lb.	.52 @	.54
Resin	lb.	.52 @	.54
Resin D	lb.	.52 @	.54
White	lb.	1.25 @	1.40
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone A, B, C, D, E	lb.	.52 @	.63
Oxynone	lb.	.77 @	.90
Retardex	lb.	.45 @	.48
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

EXTENDERS

Naftolen	lb.	.15 @	.25
Vanzak	gal.	.05 @	.06

LUBRICANTS—MOLD & RUBBER SURFACE

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Colite	gal.	.90 @	1.15
Dipex	lb.	.06 @	.08
Glycerized Liquid Lubricant	gal.	1.15 @	1.20
Lubrex	lb.	.25 @	.30
Mineralite	ton	— @	30.00
Mold Paste	lb.	.12 @	.18
Sericite	ton	65.00 @	75.00
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25 @	—
Amberex Type B	lb.	.18¾ @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.13½
Brown	lb.	.08 @	.11½
Neophax A	lb.	.119 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.08 @	.12
Sulfur Chloride, yellow (drs.)	lb.	.03 @	.08
Sulfur, rubber makers			
Refined (bags)	cwt.	2.40 @	—
Commercial (bags)	cwt.	2.05 @	—
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

SPECIAL NOTE: Much of the statistics carried in this section is of military value and accordingly have been discontinued for the duration of the war. See explanatory footnotes under each table.

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1940	780,820	303,117,726	17.33	7,060	3,197,136	20.22	773,760
1941*	739,678	301,224,726	18.18	4,177	2,116,945	22.63	735,501
1940:							
Sept.	75,770	29,317,540	17.27	666	349,443	23.43	75,104
Oct.	73,179	27,975,598	17.07	316	123,216	17.38	72,863
Nov.	69,844	26,917,136	17.21	126	52,020	18.45	69,718
Dec.	94,172	36,369,973	17.24	205	94,422	20.52	93,967
1941:							
Jan.	84,201	33,370,482	17.69	292	138,009	21.11	83,909
Feb.	70,745	28,469,753	17.97	327	144,139	19.69	70,418
Mar.	84,991	34,030,846	17.88	329	163,375	22.19	84,662
Apr.	61,288	24,193,639	17.62	238	99,371	18.96	61,054
May	98,438	39,537,574	17.93	370	204,865	24.72	98,068
June	62,124	25,179,498	18.09	476	257,254	24.13	61,648
July	94,622	39,296,581	18.54	423	219,597	23.17	94,199
Aug.	104,057	44,101,058	18.92	973	488,299	22.40	103,084
Sept.	79,212	33,045,295	18.62	749	402,036	23.96	78,463

Note: Statistics supplied by the Department of Commerce. Publication of figures discontinued with those of September, 1941, for the duration of the war. Gross Imports shown do not include latex or guayule. (*) First 9 months only.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex Tons	Liquid Latex Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1940	3,634	758,007	648	300,500	7,451	2,449,137	33,789	14,593,466
1941*	3,536	812,966	581	257,326	5,495	1,789,227	20,775	9,280,551
1940:								
Sept.	250	49,845	40	19,245	712	246,641	2,953	1,337,487
Oct.	381	77,286	70	38,092	1,150	382,168	1,156	512,153
Nov.	392	78,587	67	43,939	445	152,297	2,308	1,169,086
Dec.	278	62,586	54	39,471	1,102	341,876	3,534	1,539,957
1941:								
Jan.	447	104,128	57	32,910	698	221,911	2,184	1,019,741
Feb.	283	65,942	41	22,790	768	245,732	2,946	1,279,648
Mar.	426	98,187	36	16,147	715	258,514	1,707	774,225
Apr.	423	95,916	64	18,533	514	189,520	1,594	648,217
May	334	76,414	61	44,381	822	287,249	2,632	1,117,226
June	383	86,949	67	30,470	552	179,779	2,070	936,944
July	411	94,874	100	34,119	830	215,176	2,049	930,126
Aug.	499	111,502	41	19,344	159	50,934	1,984	779,079
Sept.	330	79,054	114	38,632	437	140,412	3,609	1,795,345

Note: Statistics supplied by the Department of Commerce. Publication of figures discontinued with those of September, 1941, for the duration of the war. Figures shown for latex are dry rubber content. (*) First 9 months only.

U. S. Consumption of Crude Rubber

(Including Latex)

	Figures on Monthly Basis: 1934	1935	1936	1937	1938	1939	1940	1941
Jan.	39,190	46,636	48,631	50,879	31,265	47,387	58,061	65,989
Feb.	40,515	42,720	36,841	51,950	25,357	43,422	52,078	62,692
Mar.	47,003	42,153	42,813	54,129	32,389	51,416	52,454	69,024
Apr.	44,853	44,247	52,031	51,859	29,730	45,268	52,361	71,374
May	42,918	41,101	50,612	51,795	30,753	45,484	54,513	71,365
June	40,147	36,156	52,772	51,860	32,540	48,438	47,834	84,912
July	32,553	35,917	48,250	43,703	34,219	44,975	48,354	68,653
Aug.	33,216	38,775	46,777	41,506	40,552	51,740	53,307	55,365
Sept.	30,258	37,086	46,449	43,945	40,183	51,402	52,469	53,655
Oct.	31,253	41,969	49,637	38,754	42,850	57,155	59,644	60,418
Nov.	34,748	42,310	50,433	34,025	49,050	55,677	57,716	N.A.
Dec.	36,569	42,474	49,754	29,195	48,143	49,636	59,709	N.A.
Tot.	453,223	491,544	575,000	543,600	437,031	592,000	648,500	663,447*

Note: Figures for 1934 to 1940, inclusive, are based on the annual surveys conducted by the former Leather & Rubber Division of the Bureau of Foreign & Domestic Commerce; figures for 1941 are estimates of the Rubber Manufacturers Association. Publication of figures was discontinued with those of October, 1941, for the duration of the war. (N.A.) Not Available. (*) First 10 months only.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks	Year	Production	Consumption Tons	Consumption % to Crude	Stocks
1932	75,656	77,500	23.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250
1935	122,948	117,523	23.9	17,000	1940	208,971	190,244	29.3	32,636
1936	150,571	141,486	24.6	19,000	1941*	228,524	212,940	32.1	38,604†

	Figures on Monthly Basis: Production	Consumption Tons	Consumption % to Crude	Stocks		Production	Consumption Tons	Consumption % to Crude	Stocks
1940:									
Jan.	19,239	16,341	28.1	27,089	July	14,299	14,539	30.1	27,129
Feb.	17,938	15,629	30.0	27,962	Aug.	17,161	14,464	27.1	28,526
Mar.	17,182	16,200	30.9	27,524	Sept.	16,379	14,835	28.3	29,039
Apr.	16,518	16,573	31.7	26,492	Oct.	19,300	16,807	28.2	30,816
May	17,499	15,984	29.3	27,141	Nov.	17,636	16,312	28.3	31,459
June	16,581	15,163	31.7	27,701	Dec.	19,239	17,397	29.1	32,636
1941:									
Jan.	20,413	19,086	28.9	33,380	July	23,111	21,725	31.6	36,751
Feb.	19,506	18,222	29.1	33,654	Aug.	24,111	20,864	38.7	39,099
Mar.	22,006	19,611	28.4	35,028	Sept.	24,678	24,032	44.8	38,055
Apr.	21,574	20,427	28.6	35,336	Oct.	26,560	25,009	41.4	38,604
May	22,775	21,405	30.0	35,871	Nov.	N.A.	N.A.	...	N.A.
June	23,790	22,559	26.6	36,265	Dec.	N.A.	N.A.	...	N.A.

Note: Figures for 1932 to 1940, inclusive, are based on the annual surveys conducted by the former Leather & Rubber Division of the Bureau of Foreign & Domestic Commerce; figures for 1941 are estimates of the Rubber Manufacturers Association. Publication of figures was discontinued with those of October, 1941, for the duration of the war. (N.A.) Not Available. (*) First 10 monthly only. (†) As of October 31, 1941.

U. S. Consumption of Gasoline

(In Thousands of Barrels of 42 Gallons)

	1939	1940	1941		1939	1940	1941
January	38,089	40,370	45,344	August	54,025	55,346	62,944
February	34,928	37,557	42,001	September	49,505	52,297	58,995
March	43,042	44,607	48,760	October	49,854	53,807	N.A.
April	44,264	47,683	55,154	November	47,407	49,074	N.A.
May	49,766	52,946	59,307	December	43,807	46,413	N.A.
June	50,133	55,459	58,360				
July	50,689	53,865	63,093	Total	555,509	589,424	493,958*

Note: Statistics supplied by the Bureau of Mines. Publication of figures was discontinued with those of September 1941, for the duration of the war. (*) First 9 months only. (N.A.) Not Available.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1930	17,364,096	1934	12,255,116	1938	10,619,338
1931	11,253,800	1935	18,664,107	1939	17,471,914
1932	6,261,336	1936	20,789,504	1940	19,378,558
1933	8,713,962	1937	22,257,798	1941	25,193,698
1942		1942		1942	
January ...	1,270,636	May	.....	September .	.....
February ..	823,357	June	.....	October ...	.....
March	668,536	July	.....	November ..	.....
April	.....	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

1939	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
December	20	—	19 7/16	19 5/16	19 5/16	19 5/16	—	19 5/16	19 5/16	—	20 7/16	20 7/16	20 5/16	20 5/16	20 5/16	—	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	—	—	—	20 5/16	19 7/16	19 5/16	—	—	—	20
1940																																
January	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 7/16	18 11/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	—	19 5/16	19 7/16	19 5/16	19 5/16	19 5/16	19	18 7/16	18 5/16	19 7/16	18 11/16	18 11/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 11/16	18 11/16	19
February	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	18 7/16	18 5/16	—	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	—	18 5/16
March	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16
April	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16	18 5/16
May	19 5/16	19 5/16	20 5/16	20 5/16	21 5/16	19 5/16	20 5/16	18 5/16	19 5/16	24	23 5/16	24	23 5/16	24	23 5/16	19 5/16	22 5/16	22 5/16	20	20	23	23	22 5/16	20 5/16	20 5/16	19 5/16	20 5/16	20 5/16	19 5/16	20 5/16	21	21 5/16	19 5/16
June	22	21 5/16	21 5/16	21 5/16	20 5/16	21 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16
July	21 5/16	21 5/16	20 5/16	—	20 5/16	21 5/16	20 5/16	21 5/16	20 5/16	20 5/16	20 5/16	21 5/16	21 5/16	21 5/16	21 5/16	20 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16
August	19 7/16	19 7/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16
September	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16
October	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16
November	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16
December	20 5/16	20 5/16	20 7/16	20 5/16	21	20 5/16	21	21	21	21	21	21	21 5/16	21	21 5/16	21	20 5/16	20 5/16	20 5/16	21	20 5/16	20 5/16	21	21 5/16	21 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	21	20 5/16
1941																																
January	20 7/16	20 7/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 7/16	20 7/16	20 7/16	20 5/16	20 5/16	20	20 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16
February	20 7/16	19 5/16	19 5/16	19 5/16	19 5/16	19 5/16	20 5/16	19 5/16	19 5/16	20	20	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16	20 5/16
March	20 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
April	22 5/16	22 5/16	22	22	22 5/16	22 5/16	22	22	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16
May	24	23 5/16	24 5/16	24 5/16	23 5/16	24 5/16	24	24	24 5/16	23 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16
June	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16
July	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16	21 5/16
August	23	22 5/16	22 5/16	23	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16
September	22 5/16	22 5/16	22 5/16	23	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16	22 5/16
October	22 11/16	22 11/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16
November	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	23 5/16	—	23 5/16	24	24	24	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16
December	24 5/16	24 5/16	—	—	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	—	—	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	—	—	24 5/16	24	23 7/8	24	24	—	—	—	23 3/4	23	23 5/16	23 5/16	—	24
1942																																
January	24 5/16	—	—	—	24 5/16	24 5/16	24 5/16	24 5/16	24 5/16	—	—	—	24 5/16	24 5/16	24 5/16	24 5/16	—	—	24 5/16	24	23 7/8	24	24	—	—	—	23 3/4	23	23 5/16	23 5/16	—	24

Note: In view of government regulations concerning the purchase of crude rubber trading in so-called "free" rubber practically stopped by the end of January, 1942, which accounts for the lack of quotations after January 31, 1942.

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49
1917	72.23	1921	16.36	1925	72.46	1929	20.59	1933	5.96

Average Monthly Price per Pound Since 1933

	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	9.32	13.10	14.35	21.37	14.63	15.75	19.06	19.88
Feb.	10.45	12.92	15.48	21.33	14.71	15.93	18.83	20.43
Mar.	11.01	11.51	15.89	24.09	13.55	16.26	18.58	22.17
Apr.	12.10	11.55	15.98	23.44	11.84	15.87	19.16	22.74
May	13.26	12.05	15.62	21.14	11.57	16.07	21.21	23.90
June	13.51	12.57	15.85	19.29	12.57	16.37	22.20	21.88
July	14.60	12.10	16.49	18.86	15.37	16.51	21.12	22.19
Aug.	15.47	11.98	16.25	18.37	16.08	16.67	19.62	22.70
Sept.	15.36	11.55	16.46	18.55	16.15	21.24	19.28	22.57
Oct.	13.96	12.62	16.55	16.28	16.89	19.89	20.33	23.10
Nov.	13.04	13.15	17.97	14.60	16.24	20.21	21.04	23.14
Dec.	12.98	13.28	20.01	15.41	16.05	20.01	20.76	24.04
Average for Year	12.92	12.37	16.41	19.39	14.64	17.57	20.10	22.40

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1941 May	1941 June	1941 July	1941 Aug.	Day	1941 May	1941 June	1941 July	1941 Aug.
1	14	—	—	—	16	14 1/16	—	—	—
2	14	—	—	—	17	—	—	—	—
3	—	13 7/16	—	—	18	—	—	—	—
4	—	13 1/2	—	—	19	14	—	—	—
5	—	13 5/16	—	—	20	13 15/16	—	—	—
6	—	13 5/16	—	—	21	13 7/8	—	—	—
7	—	—	—	—	22	13 7/8	—	—	—
8	—	—	—	—	23	13 1/2	—	—	—
9	—	—	—	—	24	—	—	—	—
10	—	—	—	—	25	—	—	—	—
11	—	—	—	—	26	13 1/16	—	—	—
12	—	—	—	—	27	13 1/16	—	—	—
13	—	—	—	—	28	13 1/16	—	—	—
14	—	—	—	—	29	13 1/16	—	—	—
15	14	—	—	—	30	13 3/8	—	—	—
					31	—	—	—	—

Note: No quotations have been made on the London Exchange since June 6.

Average Monthly Price Per Pound

Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence	Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence
Jan.	7.077	7.926	11.793	12.415	Aug.	7.841	8.545	12.818	
Feb.	7.029	7.942	12.577	12.769	Sept.	7.918	9.634	11.964	
Mar.	6.590	8.120	11.651	13.967	Oct.	8.355	10.177	11.813	
Apr.	5.793	7.910	10.980	14.228	Nov.	8.111	11.210	11.801	
May	5.632	8.002	11.600	13.670	Dec.	8.005	11.559	11.963	
June	6.147	8.216	13.046	—	Average for Year.	7.164	8.959	12.035	
July	7.464	8.271	12.410	—					

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1942 Feb.	1942 Mar.	1942 Apr.	Date	1942 Feb.	1942 Mar.	1942 Apr.	Date	1942 Feb.	1942 Mar.	1942 Apr.
1	—	—	21.14	11	19.86	20.20	21.16	22	—	—	—
2	19.58	20.19	21.23	12	—	20.22	—	23	—	20.31	
3	19.74	20.28	—	13	20.04	20.24	21.14	24	20.20	20.64	
4	19.87	20.18	21.23	14	20.07	**20.23**		25	20.06	20.74	
5	19.97	20.19	—	15	—	—		26	20.09	20.85	
6	20.07	20.15	21.33	16	20.12	20.17		27	20.16	20.97	
7	20.01	20.19	21.22	17	20.20	20.32		28	20.24	21.09	
8	—	—	21.32	18	20.20	20.36		29	—	—	
9	20.14	20.15	21.39	19	20.14	20.25		30	—	21.24	
10	19.92	20.18	21.34	20	20.30	20.24		31	—	21.12	
				21	20.07	20.25					

Average Monthly Price Per Pound

	1939 Cents	1940 Cents	1941 Cents	1942 Cents		1939 Cents	1940 Cents	1941 Cents	1942 Cents
Jan.	8.94	11.19	10.66	19.85	Aug.	9.30	9.84	17.06	
Feb.	8.97	11.10	10.87	20.07	Sept.	9.30	9.69	17.94	
Mar.	9.00	10.90	11.08	20.42	Oct.	9.24	9.62	17.31	
Apr.	8.87	10.89	11.48		Nov.	9.73	9.97	17.21	
May	9.56	10.33	12.97		Dec.	1097	10.18	18.09	
June	9.88	10.72	14.66		Average for Year	9.46	10.40	14.66	
July	9.71	10.42	16.55						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1939	1940	1941	AFLOAT 1939	1940	1941	TOTAL 1939	1940	1941
Jan.	220,727	139,304	309,411	48,210	90,285	153,169	268,937	229,589	462,580
Feb.	207,882	129,023	320,372	55,814	112,237	136,955	263,696	241,280	457,327
Mar.	201,752	134,871	338,147	55,981	113,619	140,228	257,733	248,490	478,375
Apr.	188,074	152,645	329,767	57,918	102,537	153,484	245,992	255,202	483,251
May	187,980	148,881	359,234	54,046	109,364	147,459	242,026	258,245	506,693
June	173,493	154,313	339,108	51,274	119,138	175,499	224,767	273,451	514,607
July	165,450	175,455	395,216	52,990	139,629	132,304	218,440	315,084	527,520
Aug.	152,029	194,760	446,008	66,717	141,286	90,591	218,746	336,046	536,599
Sept.	136,824	220,597	473,684	68,310	137,888	141,756	205,134	358,485	615,440
Oct.	119,404	235,353	454,711	100,500	166,837	172,633	219,904	402,190	627,344
Nov.	105,205	250,412		114,044	158,095		219,249	408,507	
Dec.	125,800	288,864		91,095	145,950		216,895	434,814	

Note: Above figures include stocks held by United States Government.

STOCKS OUTSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Singapore and Penang	Para and Manaos	United Kingdom	United States	Total
November	33,778	3,697	30,000*	276,943	344,418
December	26,773	2,165	35,000*	318,486	382,424
1941					
January	37,145	2,151	40,000*	309,411	388,707
February	46,888	2,510	40,000*	320,372	409,795
March	41,005	1,200	40,000*	338,147	420,352
April	42,065	2,205	40,000*	329,767	414,057
May	44,593	1,768	40,000*	364,107	450,485
June	43,263	915	40,000*	339,108	423,286
July	41,534	1,063	40,000*	395,216	477,813
August	44,920	1,145	40,000*	446,008	532,073
September	32,997	1,772	40,000*	473,684	548,453
October	48,399	2,048	40,000*	454,711	545,158

* Estimated.

STOCKS INSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Malaya	N.E.I.[1]	Ceylon [1]	Other *	Total
November	43,693	39,267	11,675	3,997	98,632
December	48,787	48,622	11,850	4,124	113,383
1941					
January	47,198	45,137	13,196	4,329	109,860
February	55,512	48,795	14,677	4,064	123,048
March	44,522	48,534	13,841	4,210	111,107
April	53,237	46,787	14,432	4,009	118,465
May	46,511	49,184	14,444	3,772	113,911
June	46,758	51,354	11,908	4,432	114,452
July	49,666	56,352	13,595	4,113	123,726
August	46,558	55,601	12,444	4,003	118,606
September	46,299	48,667	13,052	2,140	110,158
October	50,325	.....	14,366	3,961	.....

(1) Estates and Dealers. (*) Estimated.

RUBBER STOCKS AFLOAT

	Afloat for United States	Afloat for Europe	All Other Afloat	Total Afloat
End of: 1940				
August	141,286	55,000	53,714	255,000
September	137,033	60,000	67,967	265,000
October	166,837	60,000	38,163	265,000
November	158,095	60,000	31,905	250,000
December	145,950	60,000	44,050	250,000
End of: 1941				
January	153,169	60,000	51,831	265,000
February	136,955	60,000	48,045	245,000
March	140,228	60,000	59,772	260,000
April	153,484	60,000	61,516	275,000
May	147,459	60,000	47,541	255,000
June	175,499	60,000	39,501	275,000
July	132,304	60,000	47,696	240,000
August	90,591	60,000	.....	.....

Note: *Total Afloat* figures are estimated at 1½ months' world shipments by the International Rubber Regulation Committee. *Afloat for U. S.* is supplied by the Rubber Manufacturers Association. *Afloat for Europe* is estimated. *All Other Afloat* is determined by subtraction.

TOTAL WORLD STOCKS

At End of:	1936	1937	1938	1939	1940	1941
January	600,479	454,249	549,762	497,665	433,841	753,021
February	599,355	445,265	565,833	479,578	429,551	769,193
March	583,318	447,856	586,666	460,723	447,472	783,737
April	567,172	428,249	586,291	438,252	465,345	765,521
May	541,871	413,134	568,158	429,979	470,981	777,429
June	520,255	434,250	573,136	407,640	500,774	771,241
July	519,074	445,782	580,654	418,639	547,708	780,324
August	500,520	457,462	565,394	397,345	579,119	839,019
September	493,585	470,768	551,447	396,867	631,888	874,917
October	486,159	479,398	540,976	413,274	651,775	905,138
November	466,491	493,266	512,196	395,217	659,308	.....
December	466,576	545,533	482,852	391,125	702,089	.....
Monthly Avge.	528,738	460,022	555,280	427,192	543,321	.....

Note: Figures prior to 1941 represent principal world stocks only, as supplied by the Department of Commerce. Figures since 1941 represent total world stocks, as compiled by the Commodity Exchange, Inc.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	13,437	13,355	11,376	15,565	7,314	13,946	14,896	16,334
Apr.-June	13,565	12,597	14,892	15,834	7,380	13,759	15,636	18,308
July-Sept.	9,822	11,312	14,914	12,207	10,794	15,182	13,877	15,123
Oct.-Dec.	10,406	12,099	14,858	9,704	12,360	14,726	14,777	11,768
Total	47,230	49,363	56,040	53,310	37,848	57,613	59,186	61,533

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,730	11,154	10,554	14,143	7,388	12,445	12,791	15,264
Apr.-June	14,998	13,473	15,940	15,741	9,564	15,107	17,595	21,276
July-Sept.	11,648	13,489	14,037	13,106	11,243	15,791	12,904	18,104
Oct.-Dec.	9,310	12,066	12,855	10,495	12,098	14,165	15,484	12,519
Total	46,686	50,182	53,386	53,485	40,293	57,508	58,774	66,163

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	11,651	11,675	8,762	12,004	10,547	9,963	10,789	10,149
Apr.-June	10,219	10,755	7,556	12,081	8,337	8,632	8,871	7,088
July-Sept.	8,419	8,288	8,690	11,200	7,859	8,080	9,837	5,154
Oct.-Dec.	9,455	8,196	10,717	10,383	8,166	8,665	9,127	4,417

Figures for Recent Months

	PRODUCTION 1940	1941	1942	SHIPMENTS 1940	1941	1942	INVENTORY [2] 1940	1941	1942
Jan.	4,955	5,487	1,369	4,274	4,850	1,231	9,352	9,797	4,550
Feb.	4,916	5,162	1,113	4,144	4,896	1,116	10,137	10,029	4,553
Mar.	5,025	5,686		4,373	5,518		10,789	10,149	

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	12,823	12,553	11,891	15,831	7,314	12,383	12,801	15,349
Apr.-June	13,191	11,631	14,624	15,413	7,380	11,847	13,703	17,584
July-Sept.	10,321	11,270	15,320	12,038	10,794	13,118	12,425	13,858
Oct.-Dec.	9,891	12,425	15,201	9,092	12,360	13,300	13,308	10,591
Total	46,226	47,879	57,036	52,374	37,848	50,648	52,237	57,382

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,640	11,252	11,367	14,606	7,387	11,422	11,683	14,264
Apr.-June	14,553	11,928	15,113	15,495	9,564	13,010	14,978	18,576
July-Sept.	11,545	13,251	15,069	12,901	11,243	13,449	11,344	15,490
Oct.-Dec.	8,306	11,636	12,874	9,765	12,099	13,309	14,209	11,359
Total	45,044	48,067	54,423	52,767	40,293	51,190	52,214	59,689

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,244	10,406	8,660	11,993	10,547	8,752	8,110	8,069
Apr.-June	8,795	10,050	8,075	11,833	8,337	7,549	6,848	7,010
July-Sept.	7,639	7,565	8,595	11,326	7,859	7,206	7,970	5,431
Oct.-Dec.	9,180	8,231	10,945	10,312	8,166	7,306	7,017	4,678

Figures for Recent Months

	PRODUCTION 1940	1941	1942	SHIPMENTS 1940	1941	1942	INVENTORY [2] 1940	1941	1942
Jan.	4,199	5,112	1,328	3,761	4,473	1,257	7,417	7,633	4,712
Feb.	4,207	4,887	1,051	3,805	4,610	1,099	7,828	7,924	4,678
Mar.	4,395	5,349		4,117	5,182		8,110	8,069	

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently, and the latest available issue should be consulted for most reliable figures.

[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,426	108,369	47,057	3,732,718
1940	4,469,354	3,692,328	777,026	222,984	110,126	112,858	4,692,338
1941	4,838,561	3,744,300	1,094,261	270,431	94,045	176,386	5,108,992
1941							
July *	444,241	343,748	100,493	24,654	3,849	20,805	468,895
Aug.	147,600	78,529	69,071	17,192	3,160	14,032	164,792
Sept.	234,255	167,790	66,465	14,496	2,548	11,948	248,751
Oct.	382,000	295,568	86,432	19,360	5,635	13,725	401,360
Nov.	352,347	256,101	96,246	21,545	7,003	14,542	373,892
Dec.	282,205	174,962	107,243	20,313	6,651	13,662	302,518
1942							
Jan.	238,261	147,858	90,403	21,751	4,249	17,502	260,012
Feb.	134,134	52,200	81,834	20,181	3,989	16,192	154,315
Mar.	.....	.....	.....	.....	.....	.....	.....

* Revised.

Note: U. S. figures represent factory sales; Canadian, production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA							NETHERLAND INDIES						
	Gross Exports	Imports	Net Exports	Ceylon	India & Burma	Sarawak	British North Borneo	Thailand	Java & Madura	Sumatra E. Coast	Other N.I.	Indo-China	Amazon Valley	All Other	World Total
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	37,822	5,067	16,765	7,856	406,41
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,36
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,48
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,53
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,47
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,79
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,89
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,24
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,20
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,81
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,31
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,66
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,57
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,43
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,86
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,89
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,62

	British Malaya [1]	N.E.I.	Ceylon [2]	India & Burma [3]	North Borneo	Sarawak	Thailand	Indo-China	Oceania	Africa [3]	Liberia	South America	Mexico (Guayule)	Grand Total
1940	540,417	536,740	88,894	23,317	17,623	35,166	43,940	64,437	2,267	10,103	7,223	17,601	4,106	1,391,834
1940:														
Sept.	58,892	44,009	9,985	1,319	1,743	2,404	3,247	9,303	100	800	323	1,295	200	133,715
Oct.	52,767	50,139	8,127	1,841	1,693	2,564	3,355	2,082	200	800	600	1,860	200	126,228
Nov.	36,045	37,387	5,623	2,626	1,130	3,360	3,463	6,715	200	800	600	1,500	200	99,649
Dec.	56,263	35,325	10,700	3,405	1,028	3,520	5,343	9,000	200	600	813	1,427	392	128,216
1941:														
Jan.	37,804	58,593	7,859	1,486	2,085	2,445	2,137	9,058	333	667	750	2,103	288	125,605
Feb.	27,115	42,091	4,332	1,421	1,686	2,922	4,137	1,995	96	854	828	1,814	414	89,705
Mar.	56,651	53,233	6,073	1,770	1,154	3,726	5,712	6,286	117	636	958	2,835	355	139,506
Apr.	40,590	48,915	6,985	1,661	2,175	3,118	4,271	....	263	864	750	2,009	423	112,024
May	53,062	48,099	7,638	1,831	1,237	3,849	1,841	6,225	156	800	180	1,080	334	126,332
June	51,247	48,496	8,925	1,056	986	3,195	2,831	7,318	200	800	919	1,510	250	127,733
July	53,373	53,429	7,387	939	1,803	3,799	3,614	3,445	200	800	750	1,253	250	131,042
Aug.	46,404	51,890	9,081	725	1,812	3,086	4,852	6,496	200	800	750	1,288	250	127,634
Sept.	70,598	65,496	6,706	145	1,371	2,495	6,524	8,000	200	800	750	1,421	250	164,756
Oct.	31,101	54,038	8,315	1,563	2,264	3,044	3,074	6,000	200	800	750	2,149	250	113,548

(1) Including Brunei and Labuan; figures shown represent rubber which has actually been shipped and include rubber from the free stocks in Singapore and Penang. (2) Exports of domestic produce. (3) Exclusive of Liberia. Notes: Figures shown prior to 1940 were furnished by the United States Department of Commerce. Figures since 1940 were furnished by the International Rubber Regulation Committee, which accounts for the difference in the principal producing countries shown. Many figures for current months are provisional only and are later revised when more definite statistics are available. Therefore, it is suggested that figures from the most recent issue should be taken as more reliable.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,809
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,290	1,870	617,957
1927	403,472	60,249	14,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1939	486,348				31,615	42,352			15,426	9,612	7,051				
1940	811,564														
1940:															
Feb.	41,797	7,500	5,000*	....	3,508	5,241	1,500*	2,000*	1,846	694	495	1,200*	200*	....	....
Mar.	58,302	14,200	5,000*	....	3,062	6,057	1,500*	2,000*	1,784	....	627	1,200*	200*	....	....
Apr.	70,135	16,400	5,000*	....	3,096	2,000*	1,500*	2,000*	1,612	....	....	1,200*	200*	....	....
May	50,610	10,000	5,000*	....	3,108	2,500*	1,500*	2,000*	2,128	....	....	1,200*	200*	....	....
June	53,266	9,500	5,000*	....	1,062	3,000*	1,500*	2,000*	1,181	....	....	1,200*	200*	....	....
July	69,496	19,500	5,000*	....	5,112	3,000*	1,500*	2,000*	1,902	....	....	1,200*	200*	....	....
Aug.	72,612	21,250	5,000*	....	4,605	4,500*	1,500*	2,000*	2,508	....	....	1,200*	200*	....	....
Sept.	78,306	25,940	5,000*	....	2,743	....	1,500*	2,000*	2,485	....	....	1,200*	200*	....	....
Oct.	74,400	.....	5,000*	....	8,336	....	1,500*	2,000*	590	....	....	1,200*	200*	....	....
Nov.	72,775	.....	5,000*	....	5,451	....	1,500*	2,000*	1,366	....	....	1,200*	200*	....	....
Dec.	97,794	.....	5,000*	....	7,437	....	1,500*	2,000*	721	....	....	1,200*	200*	....	....
1941:															
Jan.	86,541	.....	5,000*	....	6,290	....	1,500*	2,000*	1,065	....	....	1,200*	200*	....	....
Feb.	73,647	.....	5,000*	....	3,770	....	1,500*	2,000*	1,717	....	....	1,200*	200*	....	....
Mar.	86,794	.....	5,000*	....	3,879	....	1,500*	2,000*	3,486	....	....	1,200*	200*	....	....
Apr.	64,521	.....	5,000*	....	2,531	....	1,500*	2,000*	2,326	....	....	1,200*	200*	....	....
May	101,034	.....	5,000*	....	5,596	....	1,500*	2,000*	1,549	....	....	1,200*	200*	....	....
June	64,101	.....	5,000*	....	2,818	....	1,500*	2,000*	1,373	....	....	1,200*	200*	....	....
July	96,658	.....	5,000*	....	4,143	....	1,500*	2,000*	2,003	....	....	1,200*	200*	....	....
Aug.	105,556	.....	5,000*	....	10,683	....	1,500*	2,000*	1,251	....	....	1,200*	200*	....	....
Sept.	81,742	.....	5,000*	....	....	....	1,500*	2,000*	4,392	....	....	1,200*	200*	....	....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. i—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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- Good Aging Properties
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Rubber Service Dept.
1012 Second National Bldg., Akron, Ohio

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DPG—DOTG—Accelerator 49
Rubber Sulphur
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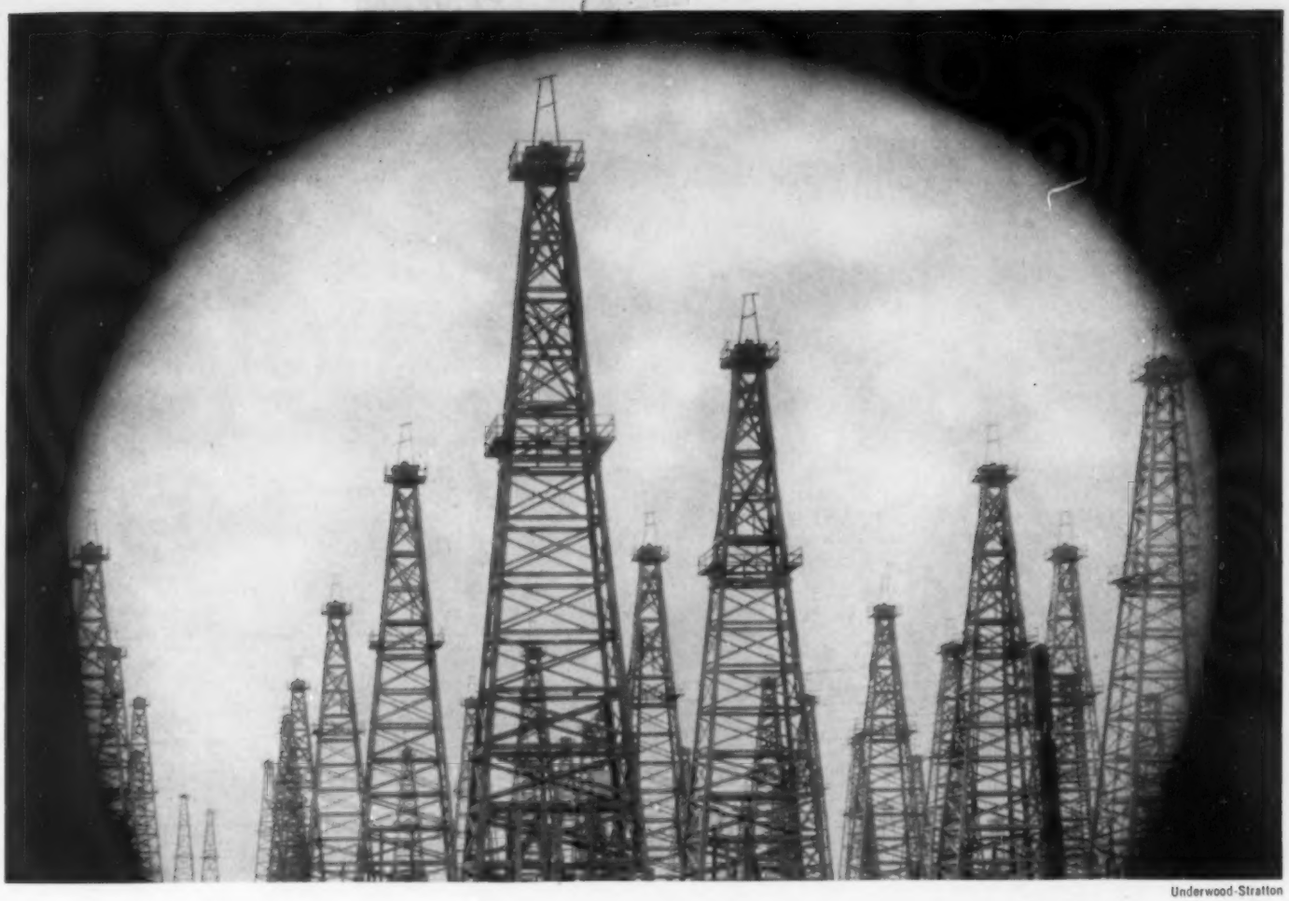

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